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REVIEW OF THE STATE OF WORLD FISHERY RESOURCES

by

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FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
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PREPARATION OF THIS DOCUMENT

This document, using statistics up to 1986 and including some information for 1987, is the biennial review of the state of the world fish stocks prepared by the Fishery Resources and Environment Division for presentation to FAO's Committee on Fisheries (COFI), and given wide circulation to interested institutions. It has been prepared on the basis of literature available throughout the world, but individual references are not given as the resulting bibliography would be very extensive.

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ABSTRACT

This paper updates the regular reviews of the state of the fish stocks, based mainly on statistics for 1986. The introduction refers to the increase in world fish production, draws attention to major changes noted in specific fish stocks, reviews some problems in the environment as they relate to fisheries development and management. The rest of the document provides a review of the state of the stocks in the main FAO statistical marine and inland areas.

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The FAO Fisheries Circular is a vehicle for distribution of short or ephemeral notes, lists, etc., including provisional versions of documents to be issued later in other series.

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A. INTRODUCTION

In 1970 the FAO Fisheries Department produced a review of the state of world fishery resources (Gulland, 1970) at a time when estimates of the world fisheries' potential ranged from 55 to 2000 million tons. The report intended to serve two purposes - first, to provide basic information on resources to indicate possibilities of development; second, to provide early warning of the need for conservation and management when catches approach the potential limit of the resources. It contained the best scientific evidence available at that time, and stressed that "too much attention should not be given to the precise value of many of the estimates".

The report clearly achieved its objectives; the drop in the rate of increase of total world landings has clearly shown the need for resource management while the estimate of overall world biological potential was set at about 100 million tons, a figure still largely valid today.

Since that time, the FAO Fisheries Department has been committed to promoting the management of fishery resources throughout the world through country, regional and international projects and meetings. A series of technical papers reviewing the resources of various fishery regions has been produced. This information, along with the most recent catch data, has been used to update a summary of the state of the world fishery resources for the Committee on Fisheries (COFI) as FAO Fisheries Circular 710.

The present document is the sixth revision of this Circular and its philosophy is similar to the original 1970 report. Fishery resources around the world are closer now to their maximum catch limits and many show signs of biological degradation and economic waste. Many of the recent global changes in landings appear to be more the result of climatic fluctuations of stock sizes than of fishery development or management processes. More is now known about the stability of fish species assemblages and their resilience to fishing, and despite the fact that not enough knowledge is available on coastal fisheries in many developing countries, it is clear that integrated management is urgently required if fisheries are to be rehabilitated or even sustained.

The frailty of the MSY estimates and their variability should be remembered when reviewing this document. The tables containing MSY figures must be viewed with caution but are still useful as orders of magnitude of the size of the fisheries. As most fisheries are now fully fished, the average of the last 10 years' catch might, in many cases, provide a good estimate of MSY and its variance.

Management should now encompass all factors affecting the resources and not only the fishing activity. Long-term variability (for climatic or other reasons) must be recognized as a major characteristic of the resources. As the fishery reaches its upper limit in yield, other human activities may become critical for resources productivity, i.e., chemical pollution, eutrophication, destruction of nursery grounds by land reclamation or by trawling, deforestation of mangroves, modification of freshwater drainage, etc. Some of these key problems are briefly outlined in the next section. Related issues and problems are discussed in COFI/89/Inf.6 entitled "Review of Development in Aquaculture."

Marine fishery resources and environmental problems

Although this review tends to deal traditionally with the effect of fishing on resources, it is important to recognize that a number of consequences of other human activities have major unwanted and often non-reversible effects on fisheries productivity. The world's oceans are generally believed to be in relatively good health, but numerous heavily populated coastal areas and enclosed seas are beginning to show serious signs of degradation which have an impact on the fishery resources and affect their potential for aquaculture.

One aspect of this problem is pollution by heavy metals, synthetic and non-biodegradable chemicals, such as herbicides (pesticides and other compounds appearing in terrestrial runoff) and radioactive wastes. Such chemicals may enter food chains leading up to man, or reduce survival (especially pesticides) of juvenile finfish and shrimp in coastal nursery areas affecting the stock potentials. Cod liver from certain areas of the Baltic Sea, for example, is not used as food because of the high level of contamination by PCBs, DDT and other persistent halogenated compounds. Another source of concern is the contamination of fish and fish products with heavy metals such as cadmium and mercury which may render the fish unfit for human consumption.

Oil pollution, although biodegradable, is of concern in many coastal areas. In areas of oil exploitation and in the vicinity of heavy naval traffic, nets are frequently clogged by crude oil and tar lumps, and catches often have to be discarded because of tainting.

Eutrophication or nutrient loading of the environment with fertilizer runoff from agriculture, domestic detergents containing phosphates, and raw and partially treated sewage effluents, can have significant effects on marine systems. Limited quantities of nutrient-rich wastes can, in the best of circumstances, cause an increase in primary production which, in some cases, can enhance the fishery resources leading to higher landings. Eutrophication, particularly in coastal lagoons and enclosed bodies of waters, such as the Baltic Sea, the Black Sea and the Laurentian great lakes, can cause oxygen depletion and mass mortalities or, as is more often the case, a gradual decline or change in composition of populations or entire ecosystems as a result of interference in a part of the life history of one or more species. Nutrient enrichment can also lead to fouling, clogging of nets (in aquaculture systems) and to toxic phytoplankton blooms (red tides) which can result in shellfish poisoning, thus requiring the closure of fishing in certain areas or seasons or the prohibition of the sale of these resources.

A serious problem on a world scale is the contamination of shellfish (in particular filter-feeding bivalve molluscs) with pathogenic organisms which are discharged with domestic sewage into coastal waters, estuaries or rivers. The fact that in many regions these shellfish are commonly consumed raw or only partially cooked increases their disease-causing potential.

Terrestrial runoff of silt due to improper watershed management and coastal dredging and land reclamation, may change the environment in a way harmful to commercially important species such as oysters, and has been implicated in the destruction of coral reefs by careless coastal development. Modification of this runoff by damming for irrigation purposes has been shown to lead to decreases in marine production and changes in species composition.

Another serious environmental problem, although somewhat neglected until recently, is the loss of marine resources due to non-biodegradable marine debris. Most of this material is found in near surface waters and includes various types of plastic materials including styrofoam packing material, polyethylene sheeting, lost fishing nets or discarded gear fragments, strapping and plastic bands, shipboard-discarded litter, etc. These materials can either kill or disable the resource through entanglement or ingestion of the material. Evidence exists on the increase in this problem (increased plastic debris on beaches, increased sighting at sea, increased number of trapped animals) but it is very difficult to assess the overall impact of the problem on the resource and more concerted efforts in that direction are needed.

If full and proper use of aquatic coastal resources is to be achieved, the management process must go beyond fishery regulations and encompass habitat conservation. Environmental degradation and pollutants in coastal waters, lagoons,

rivers and lakes must be monitored and controlled. Competing uses of the same water body have to be taken into account in order to assess their compatibility with fisheries and aquaculture.

Aquatic pollution, like migrating fish, does not respect national boundaries; therefore, a regional concept is needed to limit or prevent negative effects of one country's activities on the ecosystems and fisheries of its neighbours. Numerous international bodies such as ICES and organizations of the UN system such as IMO, IOC, WHO, FAO and UNEP have been involved in aquatic pollution research and monitoring programmes and FAO fishery bodies will have to put more emphasis on the problem in the near future.

Dumping of wastes at sea and pollution of the sea from land-based sources are controlled by the London Dumping Convention and the Paris Convention, while another, the MARPOL Convention, regulates pollution by ships. Regional conventions are also in force. These are the Helsinki Convention for the Baltic Sea, and the conventions adopted in conjunction with UNEP's Regional Seas Programme in the Mediterranean Sea, Kuwait Action Plan Region, West and Central Africa, South-east Pacific, Red Sea and Gulf of Aden, and the Wider Caribbean. Those for the Eastern Africa and the South Pacific Regions are in the process of being ratified. These regional conventions, while covering a wider range of issues regarding the marine environment, are more specific in laying out the responsibilities of their signatories.

Recent trends in world fishery resources

The recorded landings of marine and freshwater fish were 90.9 million tons in 1987, down slightly from the record 92.1 million tons in 1986 (see Table 1 and Figure 1). This is the first decline in catch from one year to the next since 1976 to 1977, but an overall continuation of the upward trend in total landings which started in the early 1980's. Total landings have increased at a rate of over 3% per year since 1980.

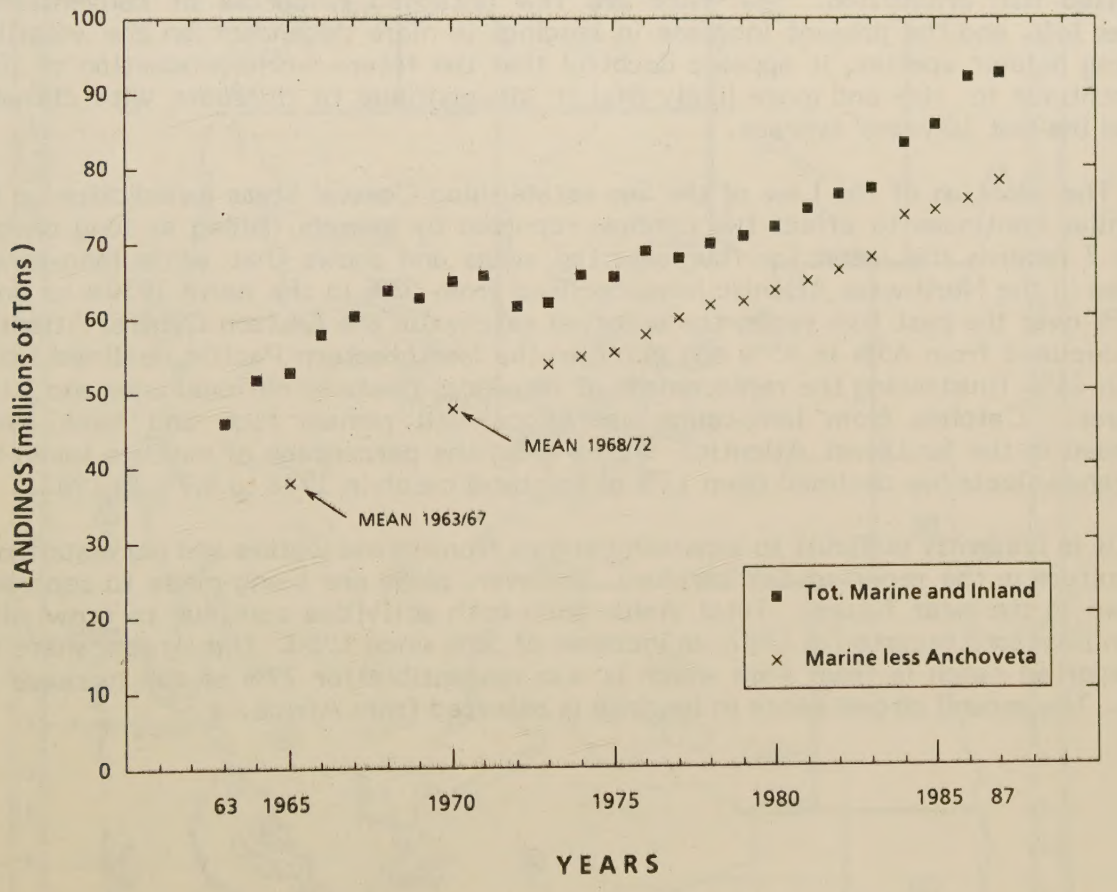

FIGURE 1

Annual world landings of aquatic resources
(excluding mammals and plants)

The increase in total landings during the 1980's has not been equally shared between the fishing areas of the world (Fig.2). Most of the increase in marine landings (98.8%) has come from the Pacific Ocean and most of this (81.8%) from the Northwest Pacific (Area 61) and the Southeast Pacific (Area 87), both of which are areas of major current upwelling. Other areas with substantial increases in catch include the Northeast Pacific (Area 67) and the Western Central Pacific (Area 71). During the 1980's there has been little change in the reported landings in the Atlantic Ocean and some increase in landings in the Indian Ocean.

Much of the increase in total marine landings during the 1980's can be accounted for by three pelagic shoaling species (Peruvian anchovy, South American sardine, and Japanese sardine) and the semi-demersal Alaska pollock from the North Pacific. Together, these four species account for 70% of the increase.

Reported world landings over the past 25 years appear to be in three stages (Fig.1): an increasing trend in total catch through the 1960's, little or no increase through the 1970's, and a second period of increasing catch in the 1980's. The increasing trend during the 1960's can be primarily attributed to increased landings of both demersal and pelagic stocks through increased exploitation of existing fisheries, the discovery of new stocks and improved fishing technology. In the 1970's, following the collapse of the Peruvian anchovy stocks in 1970/71, there was very little increase in total landings. Most of the landings of the demersal fish stocks remained at the same level of catch, suggesting that they were generally fully exploited and the total landings of the pelagic stocks, although changing from one species to another in certain areas, did not change appreciably. In the 1980's, however, with most demersal stocks fully fished, shoaling pelagic species have provided most of the world's increased fish production. As there are few untapped resources of conventional species left, and the present increase in landings is more dependent on the volatile, shoaling pelagic species, it appears doubtful that the future world production of fish will continue to rise and more likely that it will continue to fluctuate with climate around the last 10 years' average.

The adoption of the Law of the Sea establishing Coastal State jurisdiction up to 200 miles continues to affect the catches reported by vessels fishing at long range. Table 2 records the trend for four selected areas and shows that while long-range catches in the Northwest Atlantic have declined from 52% in the early 1970's to only 10-17% over the past five years, the reported catches in the Eastern Central Atlantic have declined from 65% to 49% and catch in the Northeastern Pacific declined from 79% to 21%, illustrating the replacement of non-local fleets by national ones and joint ventures. Catches from long-range operations still remain high and have even increased in the Southeast Atlantic. World-wide, the percentage of catches taken by long-range fleets has declined from 12% of the total catch in 1978 to 8.7% in 1986.

It is presently difficult to separate catches from inland waters and harvests from aquaculture in the reported fish catches; however, plans are being made to separate the two in the near future. Total yields from both activities continue to grow with 11.4 million tons reported in 1987, an increase of 50% since 1980. The largest share of the reported catch is from Asia which is also responsible for 79% of the increase in catch. The second largest share in landings is reported from Africa.

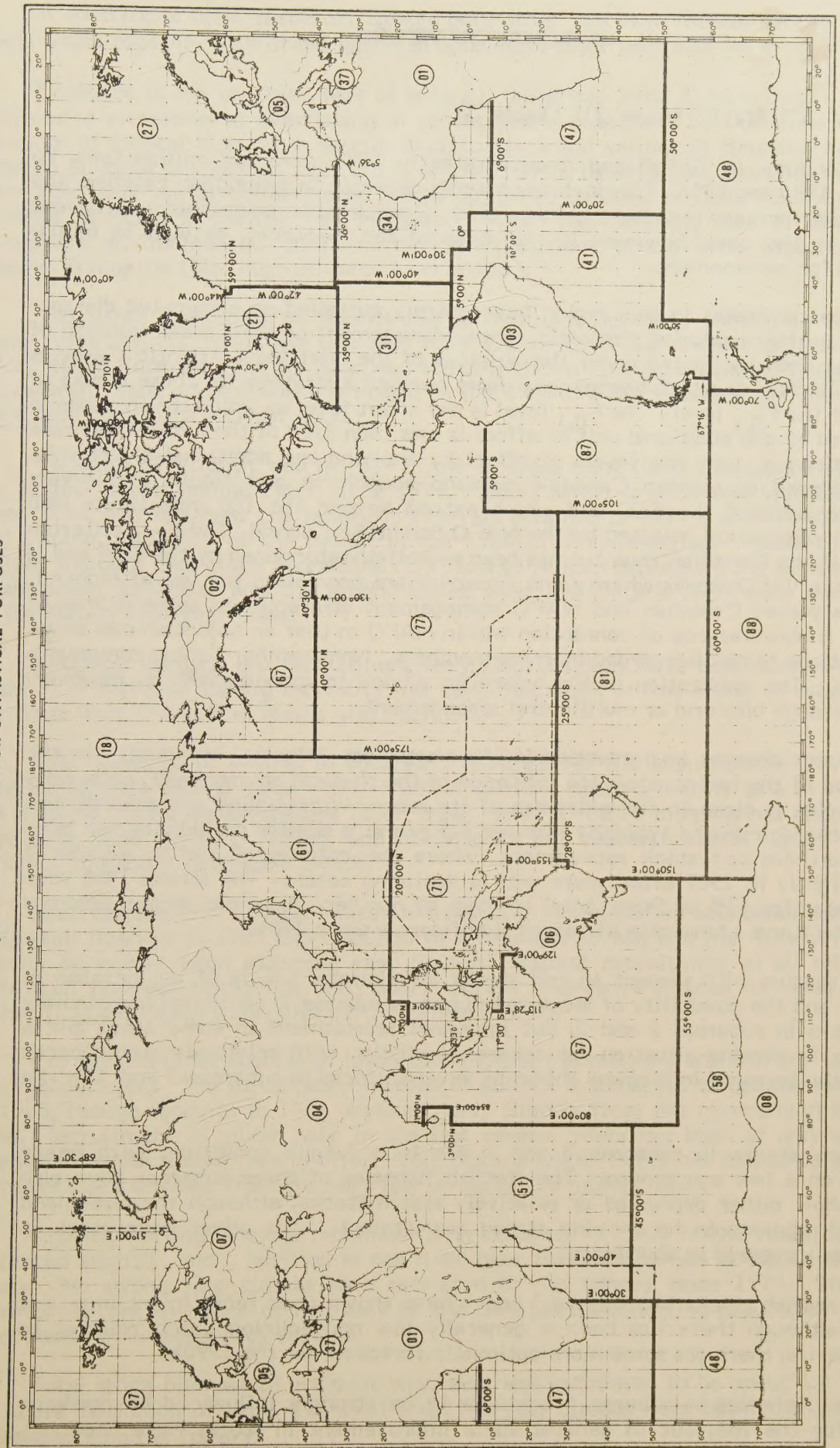

FIGURE 2 Geographic boundaries of the major fishing areas

B. REGIONAL REVIEWS

NORTHWEST ATLANTIC (Area 21) (Table 3)

Total landings of finfish and invertebrates in 1987 were 3.0 million tons, up slightly from 1985 and 1986. This includes a small decrease in groundfish catches, and an insignificant increase in pelagic catches (3%). Considerable geographical variations continue to be the case, however, in the state of the resources, as well as in the criteria used for management.

The Coastal States in this region have sharply curtailed or eliminated distant-water effort in their exclusive economic zones. Management of shelf areas seaward of 200 miles has been conducted under the auspices of the Northwest Atlantic Fisheries Organization or NAFO, which has in many cases pursued a strategy for these stocks of harvesting at the $F_{0.1}$ level. The $F_{0.1}$ level is the effort level at which the increase in yield produced by one additional unit of effort is less than 1/10 of the rate of increase in yield obtained at very low levels of effort by applying one additional effort unit. Stocks considered to overlap Canada-Greenland boundaries and stocks exclusively fished by Canada and the EEC and which extend beyond the 200 mile limits into international waters, are assessed by the NAFO Scientific Council. The $F_{0.1}$ criterion is still used in the Canadian zone but has been essentially abandoned by the USA and is in question for NAFO stocks where some countries are promoting the use of higher F levels, This places Canadian and NAFO management strategies in some degree of conflict and is also a source of contention within NAFO in that an objection can cause catch limitations to be disregarded by some members. Non-member fishing compounds this problem. The application of the scientific advice to management is, however, dealt with through bilateral or multilateral arrangement.

Long-term changes in production in the Northwest Atlantic, especially in the northern area of the region, show the influence of the physical environment, especially where a species is close to the extremes of its range. Warm/saline and cold/diluted periods in oceanic climate typically last for 3-5 years: a similar periodicity has been noted for northern cod stock recruitment, where the catches of cod in subarea 1 increased slightly in 1987 after years with a declining catch. The strong 1984 year class accounted for 63% of these total landings by number. Northern shrimp landings from subareas 0 and 1 have also increased significantly since 1984.

The situation with respect to cod stocks in subareas 1-4, is of an increase in recruitment and the possibility of stock rebuilding in subarea 1, continued low biomass in most stocks in subareas 2 and 3, but improved recruitment in some areas and a rather more favourable situation for subarea 4 stocks, with relatively stable catch rates after the increase in biomass shown by several stocks in subareas 3 and 4 in the early 1980's.

Haddock stocks in subareas 3 and 4 are in a fragile condition, with heavy dependence on a few age groups. The flatfish fisheries of these subareas have also tended to show either depressed or relatively stable stocks, although the Greenland halibut stock appears to be showing strong recruitment. The silver hake stock in subarea 4 has increased in abundance.

Some redfish stocks in subareas 3 and 4 have shown good recruitment in recent years, and although there has been a generally low or declining catch relative to earlier fisheries, there are some more optimistic forecasts for the 1990's.

Herring fisheries in subarea 4 continue to be strongly influenced by markets, especially for the roe, but in general some improvement in stocks have occurred. Improved recruitment of capelin stocks is also evident.

A substantial clam resource, Spisula polynyma, has been located on the Scotian shelf, which together with ocean quahogs, appears to offer potential for a new fishery.

Fisheries in the southern part of area 21 (subareas 5 and 6) have begun to show progressive symptoms of overfishing in recent years, especially by the trawl fishery. Landings of several high value species (cod, haddock and yellowtail flounder) are at or close to all-time low values. Soft clams and hard clam landings are also depressed and have been only partly compensated for by increased landings of ocean quahogs. Only landings of scallops showed an increase. This was probably due to impact of favourable environmental conditions during recruitment of currently exploited year classes, giving the third highest catch ever in 1987.

The other symptoms of overfishing is that landings have shifted to formerly lower value species, which are now also fully exploited. These include pollock, silver hake, other flounders, and for bivalves, ocean quahogs. The abundance of Loligo squid in research vessel surveys was the lowest in the 1968-1987 time series, but landings of Illex were up significantly in 1987.

Landings of Atlantic cod in 1987 in the Georges Bank fishery totalled 19 000 mt, the second lowest annual catch since 1977. Fishing effort in 1987 had increased 24% from 1986, and was near the record-high levels attained in 1984 and 1985. Commercial c.p.u.e. in 1987 was the lowest in the 1964-1987 time series. Research vessel indices indicate that stock abundance continues to remain depressed; the autumn index of spawning stock size was the second lowest ever. Landings in 1987 were dominated by the strong 1985 year class.

Haddock landings and recruitment from Georges Bank have continued to decline since 1979 and high fishing mortality has kept this stock at low levels of abundance. Landings from the Gulf of Maine also declined.

1987 landings of redfish in subarea 5 declined for the eighth consecutive year, with landings the lowest since 1934. Redfish are now taken primarily as a by-catch in the Gulf of Maine mixed-species otter trawl fishery. Stock biomass has declined by over 80% since the late 1960's, and commercial and research vessel survey indices continue to exhibit downward trends.

Both commercial c.p.u.e. indices and research vessel survey abundance indices of yellowtail flounder in 1987 also declined to record-low levels, and the fishery remains heavily dependent upon incoming year classes. Recent recruitment in all subarea 5 yellowtail flounder stocks has been poor. Survey abundance indices for most of the "other flounder" stocks also exhibited declines in 1987.

For several other species of lower commercial interest, the state of the stocks is less discouraging. The exploitable biomass of pollock is expected to decline beginning in 1988, though landings in 1987 declined only slightly from the record-high level in 1986. Recruitment of silver hake in the last several years has been of only average strength, but decreased fishing effort from distant-water fleets has helped to steadily increase stock biomass from the very low levels of the mid-1970's.

Atlantic herring landings remained fairly constant in 1987. Maine vessel landings increased slightly, and landings in the fixed gear fisheries remain at historically low levels. No strong year classes have recruited to the fishery since 1979. There is, however, recent evidence of recovery of the Georges Bank herring population judging from research vessel survey results.

Total stock biomass of Atlantic mackerel was estimated to be about 1.6 million mt at the beginning of 1988. The 1981 and 1982 year classes were both strong and are still supporting the fishery.

Tuna and billfish stocks in the region fall within the terms of reference of the International Commission for the Conservation of Atlantic Tunas (ICCAT) and total landings are listed in Table 19.

NORTHEAST ATLANTIC (Area 27) (Table 4) [1/]

Most of the major fish stocks in Area 27 are distributed across more than one zone of national fisheries jurisdiction and accordingly are managed and fished under agreements between countries and, where appropriate, involving the European Economic Community which are achieved either through bilateral and multilateral negotiations or by one of several international commissions (Northeast Atlantic Fisheries Commission, International Baltic Sea Fishery Commission, and North Atlantic Salmon Conservation Organization). The scientific advice on which management measures are based (e.g., total allowable catches, minimum mesh sizes, etc.) is provided by the International Council for the Exploration of the Sea (ICES) through its Advisory Committee on Fishery Management (ACFM).

Total reported nominal catches in 1987 were 10.1 million tons, compared to 10.3 million tons in 1986. Of the 1987 total, 9.2 million tons was finfish and 0.9 million tons was invertebrates. Actual catches (as estimated by scientists) for many stocks were higher than the officially-reported figures due to unreported or misreported landings, discards, etc. The most serious discrepancies in 1987 were associated with haddock, whiting, herring, and plaice in the North Sea, mackerel west of the U.K. and in the North Sea, haddock west of Scotland, and herring west of Scotland and Ireland. The unofficial estimates of total catch provided by scientists were used in the assessments produced by ICES working groups which form the basis for the management advice given by ACFM.

Most of the demersal stocks continued to exhibit downward trends due to excessive fishing pressure, undesirable exploitation patterns (i.e., too much fishing on young fish), and poor recruitment (probably related to reduced spawning stock biomass). This applies to most stocks in the North Sea and adjacent waters, around the Faroe Islands, in the North-East Arctic, and in the Baltic (cod). Fishing mortality rates for most of these stocks continue to be above most biological reference points (e.g., F_{max} and F_{med}).

North Sea cod and haddock are at record low levels, catches have been declining, fishing mortality is high and generally increasing, and recent recruitment has been poor. There is heavy discarding of haddock and whiting, and in contrast to haddock, the whiting stock has had recent good recruitment and has recovered somewhat. Saithe is beginning to recover from a decline which began in 1974. Effective management of these important roundfish stocks by means of total allowable catches and minimum mesh sizes has proven difficult because of harvesting in mixed fisheries and different optimal mesh sizes. Considerable work has been done in recent years under the auspices of ICES to develop a multispecies assessment and prediction capability taking into account prey/predator interactions involving these four North Sea stocks as well as mackerel, herring, sprat, Norway pout, and sandeel. Preliminary results from simulations of the effect of increased mesh sizes done in the multispecies context tend to differ markedly for particular species than those done in the single-species context. Further work incorporating technical (mixed fishery) as well as biological interactions is in progress in an attempt to develop a firmer basis for practical management advice.

1/ This section has been prepared by the ICES Secretariat. The statistics given in the text are the most recent figures appearing in the ICES data base. Some discrepancies may exist between these and the figures given in Table 4 due to the earlier preparation of these tables.

Landings of North Sea sole have dropped sharply since 1984. There has been an increasing trend in fishing mortality since the 1950s with a peak in 1986. The stock is presently at a critically low level, although the 1987 year class is very strong. Landings and fishing mortality for North Sea plaice have increased steadily since the 1950s. Recent recruitment has been good and the stock is relatively stable.

North-East Arctic cod and haddock have both experienced increased catches since 1984, although current levels are far below the peaks in the late 1960s-early 1970s. Fishing mortality is very high. Both stocks had a very strong 1983 year class and poor subsequent recruitment and are near historic low levels. The year classes of cod in the early 1980s suffered reduced growth rates which coincided with the collapse of the Barents Sea capelin, whose spawning stock dropped from 1.8 million tons in 1981 to only 16 000 tons in 1987 and whose catches dropped from 2.4 million tons in 1983 to zero in 1987. This rapid and massive reduction appears to have been caused by ecological factors (e.g., cod predation) and not to fishing alone. The catch of saithe in this area was the lowest on record in 1986; fishing mortality is low, and the stock appears to be stable at a relatively high level.

Catches and fishing mortality in the traditional redfish fisheries in Area 27 are at fairly low levels, with some uncertainty as to stock levels, although the stock of beaked redfish (Sebastes mentella) in the North-East Arctic is currently at a record low more than ten times smaller than at its peak in 1967. However, a new fishery began in 1982 on an oceanic stock of S. mentella in international waters between Greenland and Iceland. Catches rose from 60 000 tons in 1982-1983 to about 100 000 tons in 1986-1987. The total stock is estimated to be about 1.2 million tons.

Landings in the North Sea industrial fishery totalled about 1.1 million tons in 1986-87. Landings of Norway pout in 1987 were the lowest since 1969 due to reduced stock biomass, poor recruitment, and reduced fishing. Sandeels are currently the most important component of the fishery; landings in 1987 were the highest on record due to a large stock. Landings and stock biomass of sprat are very low.

Hake landings have been fairly stable over the past five years. Stock status is uncertain due to insufficient data, but there is clearly very high fishing mortality on young fish, the catches of which are generally discarded. Fishing mortality on the sardine stock off Portugal and Spain has been stable for the past ten years. Although spawning stock biomass dropped 40% from 1982 to 1987, a strong 1987 year class will cause an increase in 1989. Work done within ICES to develop and apply length-based multifleet, multispecies models to assess the impact of various regulatory measures (e.g., mesh sizes) on the numerous multispecies fishing fleets operating in the western approaches to the English Channel and in the Bay of Biscay indicated that compliance with existing mesh regulations would be beneficial to all fleets, and that fishing mortality should not be allowed to increase.

The catch of northern blue whiting (the largest stock in Area 27 distributed from west of the British Isles to the Barents Sea) decreased from about 800 000 tons in 1986 to about 630 000 tons in 1987. Spawning stock biomass increased to 4.5 million tons in 1986 (compared to an historic high of 6.3 million tons in 1976-1977) from a low of 2.5 million tons in 1983-1984 due to strong 1982 and 1983 year classes, but is now declining again due to reduced recruitment.

The stocks of mackerel in the North Sea and west of the British Isles have been declining since 1973-1974. The North Sea spawning stock is at an extremely low level (an estimated 37 000 tons in 1988 compared to 1.2 million tons in 1973) due to very poor recruitment and heavy fishing pressure. The western spawning stock has dropped from 3.7 million tons in 1974 to 1.5 million tons in 1988. Fishing mortality rose sharply in 1987 from a fairly stable level during 1981-1986. Catches increased from 540 000 tons in 1986 to 615 000 tons in 1987. There is high misreporting of catches

from this stock. Recruitment has been variable; the 1981 and 1984 year classes were strong, with subsequent ones being poor. This is presently one of the most important stocks in Area 27.

Horse mackerel has become an important resource in the last several years. Landings increased from 106 000 tons in 1982 to over 230 000 tons in 1987. There are thought to be three separate stocks in Area 27, but data are currently insufficient to adequately assess each of them. As a whole, however, a very strong 1982 year class throughout the area has led to a large increase in spawning stock biomass, and has supported the recent increased landings, but a decline in the stock is forecast beginning in 1988. Until other strong year classes appear, the resource will be unable to support continued landings at the present level.

In contrast to the declining trends for most demersal and many of the pelagic stocks, several of the major herring stocks in Area 27 have experienced noticeable recoveries in recent years from states of virtual collapse in the 1970s brought about by excess fishing pressure and subsequent poor recruitment. Closures or severe restrictions on fishing resulted in the gradual rebuilding of these stocks, and with the production of some very strong year classes in the 1980s, fishing has again been resumed. The North Sea stock is still increasing from a low in 1978 due to a very strong 1985 year class coupled with other good year classes. The catch in 1987 was over 600 000 tons. Spawning stock biomass is expected to be about 1.7 million tons in 1989. The Icelandic summer-spawning stock supported fairly stable annual catches of about 50 000 tons from 1979-1985 which increased to 73 000 tons in 1987. Spawning stock biomass was about 540 000 tons in 1988, the highest level seen since 1947. The Norwegian spring-spawning stock, once the largest herring stock in the world with a spawning biomass of 10 million tons in 1957, has been slowly recovering from virtually zero in 1972 to about 1.3 million tons in 1988, with a recent surge due to a very strong 1983 year class. Landings in 1986-1987 were about 130 000 tons compared to 10 000-20 000 tons during 1972-1983. Year classes following the strong 1983 have again been poor, and the stock, after peaking at about 1.5 million tons in 1989-1990, will decline unless recruitment improves.

Other smaller herring stocks which have increased or are still increasing in size include that in the Skagerrak-Kattegat and Western Baltic area, several in the area west of Scotland and Ireland, and several in other parts of the Baltic. In addition, various other herring stocks are either in stable condition or declining. Of the three sprat stocks in the Baltic, one is increasing, one is decreasing, and the other is stable, with fishing mortality generally low in all three.

Advice relative to the management of Atlantic salmon throughout the North Atlantic (exclusive of the Baltic) has been provided by ICES to the North Atlantic Salmon Conservation Organization (NASCO) since 1984.

As a general rule, the agreed TACs throughout Area 27 have exceeded the TACs recommended by ICES, and actual catches have exceeded the agreed TACs. Enforcement of management measures has not been adequate in all areas and many problems arise from the fact that many of the regulated stocks are harvested in mixed fisheries. The reliability of reported landings statistics has deteriorated for some stocks as a result of management/enforcement problems which, in turn, has reduced the reliability of the scientific advice on those stocks. As indicated above, ICES has recognized the need for multispecies assessments and advice, taking into account both the biological relationships among species and the technical interactions in mixed-species fisheries, and has been actively involved in the relevant research and development of methodologies. Some of the advice from ICES in 1988 reflected multispecies considerations, but some uncertainties in the multispecies models particularly dealing with biological interactions require further testing before a broader level of advice in the multispecies context can be provided.

WESTERN CENTRAL ATLANTIC (Area 31) (Table 5)

Reported landings from the commercial fisheries in this region have levelled off in the past few years at 2.0 to 2.2 million tons. Gulf menhaden continues to be the major species caught in terms of weight. Landings have remained much the same and were down only slightly in 1987 (907 000 tons) compared to the record catch of 983 000 tons in 1984, although USA biologists have predicted that the fishery probably cannot sustain these levels of harvest and that landings will eventually decline.

Many of the demersal resources on the island shelves in the region are already fully or over exploited. Landing figures for demersals must be qualified because they do not include the catch by sports fishermen, or the quantities discarded at sea by commercial shrimp trawlers. Along the US Gulf and South Atlantic coasts the catches of the preferred species by sports fishermen generally exceed the commercial catches. Discards by shrimp trawlers continue to be significant, though variable, for different shrimp fisheries in the area. Subtraction of these from the potential for increases in groundfish production reduces the potential for further expansion of bottomfish catches, though this remains significant. Groundfish stocks on the outer shelf and slope remain relatively untouched throughout Area 31. Continental shelf fisheries have some additional potential, however, including the more effective use of by-catch to the valuable shrimp fisheries.

The catch of snapper/grouper species has remained at the same level over the past decade, and new information on the relative slow rate of growth of deep-water snappers and groupers tend to reduce our perception of the potential yield from these resources.

The greatest potential for any further expansion of fisheries in the region will come from the smaller pelagic fish, the largest migratory oceanic pelagics, as well as possibly for squid and other less familiar types of fish. Some of the species of high interest are tunas (especially skipjack, yellowfin, blackfin and bonito), the wahoo and dolphin fish.

At least two dolphin fish stocks are believed to occur in the Caribbean, southeast and northeast of the Virgin Islands. These fish are caught by a number of Eastern Caribbean countries, and there is a need for cooperative research and management. The problems of managing migratory stocks of the flying fish are also becoming apparent between several of the island countries.

Distant-water fisheries for large pelagics have expanded within the region in recent years, that for tunas by Venezuela, and swordfish by US vessels, being especially notable. Since many of these species are migratory over considerable distances, their utilization and rational management will require close collaboration between the countries of the region.

A meeting was held on shared fishery resources of the Lesser Antilles region (FAO Fish.Rep.383) in 1986 with the objective of mapping the extent to which the major fishery resources may be shared, and to determine what information is needed to better assess the problem, and how to go about acquiring and analyzing the information. The general conclusion was that for the Lesser Antilles region, a degree of resource sharing is evident, even for shelf resources, which requires a sub-regional management framework. Steps have now been taken to prepare such a plan.

The queen conch and lobster fisheries are heavily exploited in most regions of the Caribbean, and attempts have been made in a number of countries to institute management plans, or even in the case of conch, to attempt stock rehabilitation, though success to date has been limited with this type of initiative.

Octopus fisheries occur at relatively few points around the Caribbean, notably on Campeche Bank (Mexico), in Cuba, and in Venezuela; this despite a much wider distribution and growing market which could lead to a significantly expanded fishery. The potential for squid fisheries in the Eastern Caribbean is almost undeveloped, and also deserves investigation, for both human consumption and as a bait for large pelagic and sport fisheries

Shrimp landings have changed very little over the past decade, varying between 230 000 and 280 000 tons. Considerable attention has recently been focussed (e.g., Mexico, USA, Venezuela, Guyana) on improving management of these key resources, using economic as well as biological criteria. Cooperation in management of common shrimp resources takes place between the USA and Mexico in the Gulf of Mexico, and first steps in this direction have been made in the Guyanas-Brazil region. License limitation is now becoming a reality in some shrimp fisheries; thus, Brazil has recently placed a limit of 250 vessels for fishing the shrimp stocks of northern Brazilian waters. There is also a closed season of 60 days to protect shrimp recruitment in the area. Some countries of the region have now moved to full-scale shrimp aquaculture, using wild fry. This has led to concern with the destruction of shrimp nursery habitat (mangroves and coastal marshes). There is also a growing problem in some areas with the effects of runoff of agricultural chemicals on shrimp nursery areas.

The scattered nature of the fisheries, other than those for menhaden and shrimp, and the deficiencies in much of the basic statistical data continue to make fish stock assessment difficult in the region.

Investigations on the marine resources of the area fall within the terms of reference of the Western Central Atlantic Fisheries Commission (WECAFC), except for tunas which are covered by the International Commission for the Conservation of Atlantic Tunas (ICCAT). The WECAF Commission and its two working parties (on marine resources and statistics) meet in alternate years, as does its Committee for the Development and Management of Fisheries in the Lesser Antilles. To date, WECAFC has been a consultative forum and has not realized its potential role in setting regulations or managing resources.

EASTERN CENTRAL ATLANTIC (Area 34) (Table 6)

The assessment and elaboration of biological advice for management of the resources in this region are undertaken traditionally in the framework of the Committee for the Eastern Central Atlantic Fisheries (CECAF) by the national research laboratories' bilateral assistance programmes, and the FAO regional projects dealing with fisheries management. During the last biennium, important initiatives have been taken at sub-regional level by the coastal countries themselves to promote collaborative assessments on shared stocks through working groups and it is the objective of CECAF to promote and support these initiatives as far as possible.

Some of the world's most important fisheries are found in the CECAF area. Catches in this region rose to a maximum of 3.8 million tons in 1977, falling subsequently to 2.9 million tons in 1985 and 3.0 million tons in 1986 due primarily to a crash in horse mackerel resources. The total regional catch is now back to the original average level of 3 million tons illustrating the large fluctuations of the resources under climatic and fishing pressure which are characteristic of this region.

Catches were obtained by 21 coastal countries and more than 18 non-coastal countries, giving a markedly international character to many of the region's fisheries. However, there has been reduced landings by foreign fleets and increased landings by coastal countries. The share of landings by non-African long-range fleets has declined from 68% of the catch in 1977 to 59% in 1979, 57% in 1982 and 45% in 1986.

With a few exceptions, most stocks extend beyond the coastal countries' national boundaries, occasionally being shared, as in the case of horse mackerel, by as many as 7 countries. This characteristic compounds the difficulties of stock assessment and the subsequent adoption and implementation of the management measures necessary for a rational use of the resources.

The CECAF Sub-Committee on Management has just gone through a process of overall review of all stocks in the area and the overall conclusions are: (a) most large stocks are fully fished or overfished; (b) pelagic stocks are highly variable and difficult to evaluate. Their management must be flexible and take this instability into account; (c) the rate of updating of the evaluations is not satisfactory.

The periodicity of the assessment working groups has decreased considerably during the last five years, because of lack of means at the FAO regional project level to organize the meetings and insufficient development of research at national level in many countries even though the willingness to increase collaboration between coastal countries in the northern CECAF area is very encouraging.

With 21 coastal countries and 43 stocks and groups of stocks of importance, there are about 800 stock elements to be evaluated regularly in the whole CECAF area. The data available since 1980 show that the CECAF project and the countries together produce new information (often still insufficient) on 20 stocks on the average, i.e., 2.5% of the number of available stocks. Because these updatings are largely concentrated on the northern CECAF area, the shortage of information in the rest of the region appears very clearly.

Northern Sector

In the northern sector of CECAF from Cap Spartel (Gibraltar Strait) to the north of Cape Timiris (Mauritania), the demersal stocks are almost fully exploited or overexploited. These include cephalopods, hakes, sparids, the one possible exception being the stock of black (Senegalese) hake found to the south of Cape Juby. For Maximum Sustainable Yield, the fishing effort would have to be reduced by 21% to 65% for cephalopods, depending on species and stocks, and by 25% on European hake which also needs adequate protection of small size fish.

The coastal stocks of seabreams are heavily exploited to the north of Cape Juby and markedly overexploited to the south of Cape Bojador. The recovery of the stock is threatened by the rapid expansion of the cephalopod fishery which is incidentally producing a high fishing mortality on juvenile seabreams.

The large stocks of sardines seem to have returned to historical levels with improved accessibility by coastal fleets in the north of Morocco. In addition, the stock of sardine north of Cape Blanc has apparently experienced a period of increased abundance leading to unusually large catches, especially by foreign fleets.

In the Mauritania-Senegal sector the fishery has undergone major developments in the last ten years, due to increases in fishing by foreign fleets and development of national fishing capacity. Catches have not increased and all the stocks traditionally exploited are considered at least fully fished. The levels of abundance of demersal and pelagic stocks off Mauritania have been seriously reduced since the early seventies and the future of the resources is a matter of concern.

The large stocks of mackerel and horse mackerels of that region are highly variable and their assessment is difficult. They are periodically subjected to high variations in abundance due to climatic changes, or to large increases in fishing effort, or both. However, the large drop in the landings of horse mackerels and mackerels in 1985 and 1986 does not necessarily reflect a decline in these fish stocks. Some foreign

fleets have not yet reported their catch by statistical division in the CECAF area (Table 6) which has resulted in an apparent decline in total catch for the Northern Sector of the CECAF area but not the total catch of the area.

The state of the deep sea resources (on the slope) is unknown. Fishing is intensive on shrimps, hakes and seabreams, either directly or through "incidental" mortality resulting from by-catch in the horse mackerel fishery. Research effort is insufficient and no recent assessment is available.

Southern Sector

In the Sherbro area (Sierra Leone and Liberia) the state of the stocks is not well known. It has been heavily fished by foreign fleets in recent years, but biological data and statistics are still inadequate for a detailed scientific analysis. From data collected by an acoustic survey in the Sherbro area it appears that the large stock of Balistes which developed in the seventies is decreasing rapidly, probably because of fishing pressure and a change in the climatic conditions.

Throughout the sector, the most commonly captured fish species in depths less than 50 m seem to be fished at about the level of maximum exploitation. Demersal stocks, further offshore from 50 m to 200 m, are still some way from full exploitation. However, it is unlikely that their exploitation rate will increase because the fishery is not economically attractive due to the lower density of fish and catch rates, and higher fishing costs.

The pink shrimp (Penaeus notialis) present in small concentrations from Senegal to the Congo seems to be exploited at the level of maximum biological production. Competition exists between artisanal inshore and industrial offshore fisheries. As catch rates increase, shrimpers are keeping larger and larger amounts of fish by-catch for marketing and better use is being made of fish which used to be discarded.

The important stock of Sardinella aurita of the Cote d'Ivoire-Ghana-Togo-Benin area, which had collapsed in the past due to both high fishing pressure and bad climatic conditions, returned to record high levels in the mid-eighties. However, a bad year has been predicted for 1988.

There is a general lack of data on resources in the whole southern Gulf of Guinea, where many countries have not yet developed the appropriate data base and research structure. The demersal stocks of the deep shelf and slope, especially on hard bottoms, seem to be still underfished in most of the southern Gulf of Guinea. They may offer some potential for modern artisanal fishing with gillnets or longlines.

MEDITERRANEAN AND BLACK SEA (Area 37) (Table 7)

Advice and recommendations for the management of the resources of this area are elaborated through the General Fisheries Council for the Mediterranean (GFCM) and the Joint Commission on the Fisheries of the Black Sea. Since 1980 the evaluations of the resources have been updated as regularly as possible within the framework of GFCM in a series of technical consultations held every year in the Western and Central Mediterranean area, the Adriatic Sea, and the Eastern Mediterranean.

Recorded landings show a continuation of an upward trend from 1.1 million tons in 1973 to 2.0 million tons in 1987, a record year. The increases have slowed considerably from 1982 to 1987 with catches of 1.88, 1.89, 1.93, 1.89, 1.97 and 2.0 million tons respectively. Most subregions have shown a general increase in total landings, of some 1-6% per year; only the Gulf of Lions and Levant regions have shown slight declines.

In the Western Mediterranean all the stocks are very heavily exploited with the possible exception of mackerel and horse mackerel, while in the Adriatic there is evidence of overfishing of most of the highly valued demersal species such as hake and red mullet. In the Central Mediterranean the demersal resources generally are fully exploited to heavily overexploited: off Italy demersal stocks are very heavily fished, and fish density there is about one-fifth that of Tunisian waters. Despite this, landings of demersal species of the continental shelf of the Mediterranean have increased for most species by some 3-8% per year between 1975-76 and 1985-86. Overall reported landings of Mullus spp. and Merluccius both rose by 5-7% per year, and similar rises were reported for prawns and shrimps. Landing trends for Pagellus spp. and the general category of cephalopods were more modest, at 3-5% per year. A few species, such as Maena spp. registered small overall declines.

It may be possible to explain some of this increase as a result of the higher fishing effort exerted, and/or improvement of the statistical data base, but some other factors such as an increase in productivity of coastal waters cannot be excluded.

Past heavy fishing effort in Cyprus has reduced catches of formerly abundant species, and led to a fishery dependent on smaller species. In response to this situation, the trawl fishing season was closed for a period of time in order to protect the young fish stocks. This measure roughly doubled the fish landings, and increased profitability for artisanal and trawl fisheries. It also led to dramatic rises in fishing effort by both trawl and artisanal fleets, with the result that increased profits for individual fishermen are still not being generated by the fishery. As a conclusion that might be applied to Mediterranean fisheries as a whole, fisheries economists have recommended that in the event of increases in catches due to improved management, dissipation of the resultant profits could be avoided by license limitation of both artisanal and industrial fleets.

Italy has recently introduced the use of seasonal closures to protect their young fish stocks.

Coordinated management of shared resources remains a problem for most Mediterranean fisheries. The degree of mixing between Italian and Yugoslavian demersal and pelagic resources and the consequent need for coordinated development and management programme is still to be assessed. Separate fishing areas in Israel are now allocated for different types of gear in order to reduce conflict between trawlers and other gears. The realization that a common resource in the Gulf of Lions is now being fished outside the national waters of Spain and France, led to the ad hoc GFCM meetings in which a management and statistical framework was set up. Bilateral consultation on a regular basis continues, with the objective of eventually moving to a special management regime for the area with a common framework for statistical exchange and fleet licensing.

The small mesh size used in trawling in many countries continues to be a problem and the need to enforce the 40 mm mesh size regulation has been generally supported by the Adriatic and Western Mediterranean Consultations.

A high degree of fluctuations in stock size characterizes the small pelagic stocks of the Mediterranean, being well documented in the fisheries in the Sea of Alboran and the Adriatic. Echo-integrator surveys in the Gulf of Lions in 1985 revealed a biomass of 100 000 t of small pelagics, 60% of which were sardines. These stocks were considered fully exploited, with a Maximum Sustainable Yield estimated at 20-24 000 t. The stock size of sardine has increased since 1976, and that of anchovy has declined.

The sardine stock appears to be underexploited in the Baleares, judging from hydroacoustic surveys. The sardine stock in Morocco appears to be fully exploited, and

has declined recently relative to anchovy. Mediterranean stocks of horse mackerel, in general, appear underexploited. Small pelagic stocks in Algeria appear to be underfished at present, especially for anchovy.

The combined anchovy catches from the Mediterranean and Black Sea have shown annual increases of about 2% per year from 1975-76 to 1985-86. However, when the very high proportion landed by Turkey and the USSR is subtracted (presumably all taken from the Black Sea), the picture seems to be one of a slight decline in Mediterranean anchovy catches between 1975-76 and 1985-86. This decline was most emphasized in the Western and Central Mediterranean (France, Italy, Morocco and Spain).

Small pelagics landings have been variable, but there has been an overall increase of roughly 4% per year for all small pelagics combined over the last decade.

Landings of large pelagic fish from the Mediterranean have increased over the last decade, with some indications that local levels of natural production are being exceeded in recent years. Bonito, Sarda sarda, and swordfish, Xiphias gladius have shown landing increases averaging over 8-10% per year - figures almost equalled by bluefin tuna. Local increases in fishing effort, or new or expanded fisheries, such as those for swordfish in Greece, Malta, and in the Ionian Sea, appear to account for increased landings, not increases in abundance. Local declines in mean size of swordfish have already been reported in several fisheries in the Eastern Mediterranean, and the need is apparent for some coordination of research and statistics gathering. This is also true for bluefin tuna: a species considered by ICCAT as in need of conservation measures. Possible problems with other highly migratory species may be indicated by the decline in landings of Pomatomus.

The need for a common framework for tackling management problems of such highly migratory fish is apparent, and the GFCM should consider possible actions, preferably in common with ICCAT.

The complex of problems faced in many Mediterranean countries with fishery management are most clearly focussed on the coastal zone, where critical habitats for fisheries (nursery areas, sites for aquaculture development), often encountered uncontrolled expansion in the use of the same areas for other human activities, such as tourism, domestic waste disposal and runoff of chemicals from industry and agriculture.

Overall landings have risen in the Black Sea over the last two decades, but there has been a significant decline in diversity; currently biomass being dominated by anchovy and sprat. This could be related to eutrophication from various sources of inflow to the sea. A degree of eutrophication has been documented also for the Adriatic Sea, and for coastal waters in other areas of the Mediterranean. The extent to which this is responsible for increased pelagic and demersal production over the last few decades is not yet clear, but deserves serious investigation.

SOUTHWEST ATLANTIC (Area 41) (Table 8)

Total catches in this area have been increasing steadily over the last five years from 1.5 million tons in 1982 to 2.1 million tons in 1987.

One of the main fisheries is for hake (Merluccius hubbsi), exploited almost entirely by fleets from Argentina and Uruguay off the River Plate basin and on the northern Patagonian shelf area. After being fairly stable at about 350 000 tons per year, total catches of this species dropped to 260 000 tons in 1984, mostly due to reduced fishing effort by the Argentinian fleet that started to target on red shrimp (Pleoticus muelleri) further south. However, recent catches of hake have increased to

372 000 tons in 1985, 377 000 tons in 1986, and 381 000 tons in 1987. The stock seems to be moderately to fully exploited.

No major changes were noted in the catches of croakers and weakfishes. Most of the stocks are moderately to fully exploited, although there are some limited possibilities for further expansion in northern Brazil. The stock of weakfish off the River Plate basin seems to have recovered after management measures were introduced in 1983.

Catches of sardinella, taken exclusively by Brazil, have been at about the same level for several years. The stock seems moderately to fully exploited. Other stocks of clupeoids and other small pelagics are lightly fished. The stock of anchoveta off the River Plate basin is virtually unexploited, with an estimated potential of a several hundred thousand to 1 million tons per year. Catches of this species dropped from 28 000 tons in 1983 to 17 000 tons in 1987, and attempts to develop an industrial fishery have been unsuccessful.

Major changes continue to occur in the stock of red shrimp in the central Patagonian shelf area. Catches increased steadily from 2.6 thousand tons in 1981 to 22 000 tons in 1984, but then dropped to 10 000 tons in 1985 and 7 000 tons in 1986 and 1987. The increase in catches from 1981 through 1984 was associated with a natural increase in the overall abundance of the stock and the increased fishing effort of fleets that traditionally were fishing for hake and other demersals off the River Plate basin. The reduction in catches during the last two years is almost certainly associated with a decrease in abundance of the stock which may be related to environmental changes and/or heavy fishing. The area of distribution and the high variability in abundance of this stock should be taken into account when managing and planning the development of the fishery.

The catches of squid in this area have increased rapidly from 31 000 tons in 1980 to more than 300 000 tons in 1986, and 600 000 tons in 1987. Most are short-fin squid (Illex sp.) and common squid (Loligo sp.) caught in the southern Patagonian shelf and slope area. Limited catches of flying squid (Martialia sp.) have also been reported in the last two years.

The short-fin squid was exploited in the late 1970's mainly by the Argentinian fleets. Recently, long-range fleets, mainly from Japan, Poland, and the Republic of Korea, have greatly increased the landings of this species to 234 000 tons in 1985, 220 000 tons in 1986 and more than 400 000 tons in 1987. After a period of great uncertainty regarding the state of this stock and the fear of overexploitation, some management measures were introduced to regulate fishing effort in some of the main fishing grounds. This has helped to keep fishing effort within reasonable levels in the areas under control, but fishing in the other areas seems to be increasing rapidly. The overall abundance of this stock varies from year to year due to natural causes and close monitoring is needed for adequate protection. Until 1986 the stock was considered to be fully exploited.

Catches of common squid have also increased very rapidly in the Patagonian shelf area from less than 1 000 tons in 1981 to 84 000 tons in 1986 and to probably more than double this amount in 1987. Main countries fishing for this stock are the USSR, Poland, Spain and Japan. This stock is probably fully to heavily exploited.

The other main fishery in the Patagonian shelf and slope area is for southern blue whiting (Micromesistius australis) caught by Polish and Soviet fleets. Catches of this species have been more or less stable at around 100 000 tons a year since 1984. The stock is lightly to moderately exploited.

Other demersal fish stocks in the Patagonian shelf area include the grenadiers (Macruronus sp. and Macrourous sp.), tadpole mora (Salilota australis), cusk eel (Genypterus blacodes), toothfish (Dissostichus eleginoides), sharks, rays and nototenids. Most of these stocks seem to be lightly to moderately exploited.

Prospects for management of the fish stocks in this area are, on the whole, encouraging. Ten interstate permanent working groups in Brazil are responsible for providing advice on the management of a number of fisheries off the Brazilian coast. These working groups meet periodically to update information and data and assess the situation of the stocks off Brazil.

Argentina and Uruguay have established a Common Fishing Zone and a Joint Technical Commission for the region off the River Plate basin which is responsible since 1974 for coordinating the research and the adoption of management measures in the area.

In the offshore Patagonian shelf and slope area, fishing effort by long-range fleets has built up rapidly in the last few years. This raised serious concern for the conservation of the fish stocks in the area, particularly due to the lack of measures to regulate the incorporation of new fishing vessels and the fact that some important fish stocks occur and were being exploited both within the 200 nautical mile limit, where national jurisdiction could be exerted, and in the area beyond and adjacent to it, where no national jurisdiction is recognized. Prospects for management and conservation of the fish stocks in this area have, however, improved during the last two years. This is due to the adoption of management measures that are contributing to regulate fishing effort in some of the main fishing grounds, although fishing in the high seas still remains to a great extent unrestricted. New information is also available on the fish resources and on the type and amount of fishing which has greatly contributed to a better understanding of the status of the fish stocks.

FAO Fisheries Technical Paper No.286 (1987) examines the state of the main fish resources exploited by the offshore fleets in the Southwest Atlantic and provides some guidelines regarding the research and management of the offshore fisheries in the region.

SOUTHEAST ATLANTIC (Area 47) (Table 9)

The exploitation of the stocks of this region is monitored through the International Commission for the Southeast Atlantic Fisheries (ICSEAF).

The reported catches increased significantly in 1987 (2.6 million tons) compared to the catches from 1984 to 1986 (averaging nearly 2.1 million tons). A large share of the catches in this area (59% in 1986) continue to be taken by distant-water fleets. Pending independence of Namibia, there is no coastal state control over fishing off Namibia beyond territorial waters and Angola has emphasized the development of its small-scale, inshore fishery and not placed many restrictions on foreign fishing vessels.

The two major groups of pelagic species in this area are the clupeoids (pilchard and anchovy, exploited mainly by the local purse seine fleets) and the horse mackerel (exploited mainly by the large distant-water trawlers). The biomass of the horse mackerel stocks doubled between 1970 and 1980, but have stabilized since then. The landings in 1987 were 633 000 tons compared to the catches from 1983 to 1986 of 684, 640, 512 and 587 thousand tons respectively.

The pilchard stocks off Namibia and South Africa are both at very low levels (total 1987 catch of 101 000 tons). However, there was a major increase in the anchovy stocks off Namibia and South Africa in 1987. Record catches were noted for both areas: 376 000 tons off Namibia and 596 000 tons off South Africa. This is the first suggestion that anchovy stocks may be expanding to balance the decline in pilchard stocks, as happened on the western coast of North America, where the species composition changed from a pilchard to an anchovy fishery.

The principal management measure in all the fisheries continues to be annual catch quotas which are sometimes divided into national allocations. The hake quota off

Southern Angola and Namibia in 1987 was 411 000 tons with an estimated hake catch of 270 000 tons. A hake quota of 138 000 tons was suggested for the fishery off of South Africa which was fully taken.

The horse mackerel quota set off Namibia was 472 000 tons in 1986. The catch was estimated to be 503 000 tons.

Due to the difficulty in obtaining reliable estimates of population size of the anchovy stocks off Namibia, ICSEAF scientists have recommended that fishing be restricted to the customary six month season commencing in March which should permit an acceptable level of survival of recruits into spawners. The spawning stock of anchovy off South Africa was estimated at 1 million tons and a preliminary acceptable catch of 300 000 tons was endorsed as being most reasonable.

ICSEAF biologists have urged the collection of data suitable for stock assessment for a number of species for which there is limited information including soles, kingklip, monkfish, chub mackerel and squid.

WESTERN INDIAN OCEAN (Area 51) (Table 10)

Total recorded landings in the area were 2.7 million tons in 1987, similar to reported landings in 1985 and 1986. The major fishing countries, with the percent of total area catch in brackets, are: Indian (46%), Pakistan (13%), Sri Lanka (5%) and Iran (5%).

Landings in India were 1.2 million tons in 1986 compared to 1.3 million tons in both 1984 and 1985. The demersal finfish is comprised of a large number of different species with croakers, Bombay duck and catfish being the most important. Principal pelagic species include Indian oil sardine, Indian mackerel and anchovies. Total landings of shrimps have remained relatively stable but a shift in species composition towards smaller less valuable species has been observed. The shrimp stocks appear to be heavily exploited.

Pakistan fish landings increased to 330 000 tons in 1986. Landings of shrimps have remained at a fairly constant level over time and appear to be fully exploited or overfished. Attempts have been made to encourage the fishery to move into deeper waters for unexploited resources, including sharks.

Sri Lanka landings have dropped from 180 000 tons in the early 1980's to around 140 000 tons in 1986, partly as a result of the political situation. Tuna and small pelagic species such as sardines form the bulk of their catches.

Landings in the Maldives, primarily for tuna and tuna-like species, decreased from 55 000 tons in 1984 to 46 000 tons in 1986.

Landings in the Gulfs were estimated to be 335 000 tons in 1986 but only a few countries have been collecting fish statistics on a routine basis.

Landings of shrimp in Kuwait have been relatively stable at 2 000 tons over the past decade while the Saudi Arabian landings have increased from 1 000 tons in 1980 to about 5 000 tons in 1986.

Acoustic surveys in Omani waters in 1984, by the Norwegian research vessel DR. FRIDTJOF NANSEN, indicated the presence of a pelagic biomass of 1.2 million tons of small pelagic species (scads, mackerels and sardines) and a demersal biomass of 345 000 tons (seabreams, catfish, croakers, grunters and emperors). The maximum yield has been estimated at 270 000 tons of pelagics and 77 000 tons of demersal fish. Only 80 000 tons of pelagic and 20 000 tons of demersal fish were landed from Omani waters in 1986.

A gradual increase in total landings has been reported in the Red Sea and Gulf of Aden. Small pelagics, sardines and Indian mackerel are generally believed to be unexploited there.

Landings in the western region of the area have slowly increased, primarily from fishing by foreign fleets. Most of the stocks in the region are fully exploited except for pelagic resources off Somalia, Mozambique and probably Madagascar. The Tanzanian shrimp fishery has expanded through a joint venture with a Kenyan company. A fishery for mangrove crabs is under development in Madagascar.

Foreign fleets caught 11% of the landings in the area in 1986, the major part of the catch being for tuna and tuna-like species. This fishery only started in 1981. France, the Republic of Korea, Spain, the USSR and Japan were the principal countries fishing for the large pelagics.

The Indian Ocean Fishery Commission (IOFC) is the regional organization for the Indian Ocean (Area 51 and Area 57) that assists and coordinates national programmes in fisheries development, promotes regional research activities and examines management problems relating to offshore resources. Special committees are set up for the management of fish stocks in the Gulfs, Southwest Indian Ocean, Bay of Bengal and the Indian Ocean tuna. These committees have no regulatory powers but act as advisory bodies in the management of the fishery resources in the various countries in the region.

EASTERN INDIAN OCEAN (Area 57) (Table 11)

The reported landings in this area were 1.9 million tons in 1986, a record catch, and were down slightly in 1987. However, the landings have levelled off from 1983 through 1987 varying only from 1.8 to 1.9 million tons.

The major fishing countries in the area, with percent of catch in brackets, are: India (28%), Burma (27%), Thailand (16%), Bangladesh (11%), and Indonesia (9%).

Burma continues to report only total landings and Bangladesh reports just toli shad, crustacea and mixed fish but even these figures are not based on sound statistics. Other countries also report large landings of miscellaneous fish and, therefore, just over 50% of the total landings are classified by species.

The total catch from India in this area has been quite stable at roughly 500 000 tons per year. Some concern has been expressed over the highly efficient high opening trawl gear which may cause conflicts with small-scale fisheries.

The prawn fisheries of south and western Australia are subject to strict, ongoing controls to maintain stock levels but future increases in catch will be small, if any. The western rock lobster landings are in the order of 10 000 tons and present catch can be predicted with a fair degree of accuracy. Most of Australian fisheries are managed by closed seasons, limited entry, total catch, gear limitations, etc.

Trawl surveys in the Bay of Bengal have indicated a limited resource of fish and shrimp in deeper waters but rough configuration of the bottom and the cost of deep-water trawling suggests that other types of gear should be considered for this resource.

An evaluation of the marine shrimp resource in Burma indicated heavy exploitation of the stocks along the Tenasserim coast while the Rakhine area shows no clear evidence of over-exploitation. Suggestions have been made for improving the statistical system of catch records and for the collection of biological data. Recent estimates have been made of the biomass of the demersal fish stocks in both Burma and Bangladesh.

Demersal fish off Western Australia is to a large extent exploited by foreign pair trawlers. Pelagic resources off South Australia, including jack mackerel, pilchards, snoek and gemfish are under-utilized. Prospects for trawl fisheries in this area are not very good, but harvesting of substantial squid resources has recommenced recently in cooperation with other countries.

The assessment and management of fish resources, with some exceptions, are generally at a low level throughout the region. Many coastal pelagic stocks, both small and large sized species, including coastal tunas and Spanish/king mackerels, are believed to be lightly exploited in the northern part of the region, but no adequate assessment can be made due to poor information. Information is also lacking on the cephalopod resources.

The state of the stocks of oceanic tuna fished in this area are covered in Table 19 on tunas. The Indian Ocean Fishery Commission (IOFC) is the regional organization for the Indian Ocean and information on the Commission is covered under Area 51.

NORTHWEST PACIFIC (Area 61) (Table 12)

The total catch declined slightly in 1987 to 2.5 million tons compared to the record catch in 1986 of 2.6 million tons. The total catch has levelled off over the past four years, varying from 2.4 to 2.6 million tons. Alaska pollack and Japanese pilchard landings were again the dominant species in the area, together accounting for 40% of the total landings.

The fishery for Alaska pollack in the northwestern Pacific has the highest yield for any single demersal species in the world. The landings were 5.1 million tons in 1986, a record year, and 5.0 million tons in 1987. Most of the catch is taken by the USSR and the Democratic People's Republic of Korea. The catch continues to rise even though the stocks are considered to have been fully exploited.

The catch of Pacific cod is the second largest single species catch in the demersal fishery and the stocks appeared to be fairly stable through the early 1980's with landings of around 80 000 tons. However, the catch of cod has increased to 200 000 tons in recent years, primarily from incidental catches directed at other target species such as pollack and flatfish.

Serious overfishing is evident in many of the demersal stocks in the southern region, including the Yellow Sea and East China Sea, The abundance of the demersal stocks of commercial value in this region is estimated to be one-fifth to one-tenth of their previous levels and there has been little sign of recovery.

Salmon stocks in this region are generally in good condition with the exception of chum salmon originating from USSR rivers. There has been an increase in the landings of pink salmon by the USSR, both odd and even-year classes, and an increase in chum salmon from Japan. Intensive restocking programmes in the USSR rivers should help the recovery of chum salmon stocks.

The coastal pelagic fish stocks in this area are very productive. They exhibit large fluctuations in abundance and change dramatically in dominance from one species to another. An example of this has been the change in abundance of the Japanese sardine around Japan. The catch in the mid-1960's was around 9 000 tons but now exceeds 5.1 million tons making it one of the world's largest single species catch. Management of such unstable pelagic fish stocks is quite difficult and requires frequent monitoring of the population.

Clear causes for these changes are unknown; it has been generally accepted that they are probably natural causes and there is little evidence of a direct link with fishing. In recent years the abundance of Pacific saury has declined moderately and remained at a low level, while Japanese jack mackerel and Pacific herring have seriously declined. Japanese chub mackerel appears to be in a descending phase, probably related to the recent outburst of the Japanese sardine stocks. In contrast, the fishery for the Japanese anchovy has been fairly constant over the years which may indicate its stability against changes in both the environment and fishing mortality.

The annual landings of the Japanese flying squid continues to decline from over 400 000 tons in the early 1970's to 150 000 tons in 1987. The causes for this decline are unknown but Japan has prohibited fishing during major fishing seasons in the Japan Sea to protect the spawning stocks. The cephalopod stocks around Japan are considered fully exploited but the oceanic squids in the northern region, along with neritic cephalopods in the southern region could provide substantially larger catches.

Prawn and shrimp stocks are considered fully exploited and little change in the landings is expected.

At present, there is no functional multilateral organization to cover the entire area although such an organization would be helpful in the assessment and management of shared fish stocks. Present research and management are the responsibility of the individual coastal countries. Five bilateral fishery agreements between individual countries currently exist in the region through which management of the shared stocks are partially conducted.

NORTHEAST PACIFIC (Area 67) (Table 13)

The total catch from this area reached a new high of 3.5 million tons in 1987 compared to 2.4, 2.2, 2.4, 2.7, 2.9 and 3.2 million tons from 1981 to 1986, respectively. The USA catch accounted for a large percent of the total due to the expansion of joint ventures principally with the Republic of Korea, Japan and Poland. Half of the total landings are for Alaska pollack.

Total landings of the major salmon stocks reached record catches in 1985 but declined in 1986 and again in 1987. Total catches have remained fairly stable from 1980 to 1986, varying from 340 to 435 000 tons.

Halibut stocks are closed to fishing by non-coastal countries. The 1986 halibut catch was the fifth largest in the history of the fishery. The stock, depleted during the sixties and early seventies, has been recovering since around 1975. Management strategies have restricted the commercial harvest and called for catching approximately 75 percent of the estimated annual surplus production. Problems have occurred recently in restricting the amount of fishing effort, particularly the number of US vessels. A shorter annual fishing season, 4-5 days in some areas, was recently tried to limit effort with some success and a limit on the weight caught per vessel is being considered.

The catch of the yellowfin sole in the Bering Sea reached a record level in 1987 after a long period of increase starting in the early 1970's. Abundance in 1986 was only moderately below peak levels. The catch of "other flatfish" has been at a high level since the early 1980's.

High production of the Alaska pollack continues in the area. The total catch has increased from 1.0 million tons in 1981 to 1.8 million tons in 1987. Pollack abundance remains high and is supported by the 1982 year class although the 1983-86 year classes are below average.

A midwater trawl fishery for pelagic pollack has rapidly expanded in the Aleutian Basin of the Bering Sea since 1980 and is responsible for much of the recent increase in landings. The international waters in the center of the basin have become the most important fishing ground for non-USA fisheries, coincidental with drastic reductions in catch quotas to non-domestic fisheries in the USA's 200 mile limit. Vessels of Japan, the Republic of Korea, Poland and China have operated in these international waters. The relationship between the demersal and these pelagic forms of pollack is presently unknown. Biological knowledge on this resource is limited and a conference, under the auspices of IPHC, was held to study and exchange information needed for stock assessment.

Pacific cod catch has increased substantially since the mid 1970's. Abundance remained at a peak level in 1987 due to contributions of the strong 1977 and 1978 year classes.

Pacific Ocean perch stocks were depleted by heavy fishing during the 1960's and have remained at continued low abundance through the 1980's. Several strict management measures have been imposed on the fishery for some time now and recent evidence suggests that the condition of the stocks has shown some limited improvement.

Sablefish are at historic high levels of abundance in the Gulf of Alaska as a result of the recruitment and growth of the 1977 year class and indications of good recruitment for the 1980 and 1981 year classes.

A Pacific Salmon Treaty was enacted in 1985 between Canada and the USA in order to enable the countries to reap the benefits of their respective management and enhancement efforts. A Pacific Salmon Commission establishes general fishery management objectives for international conservation and harvest sharing of intermingling salmon stocks.

The International Pacific Halibut Commission (IPHC) is comprised of Canada and the USA and deals with research and management of the Pacific halibut resources in the entire area. Fishing for salmon and halibut is completely prohibited for other countries in this area.

WESTERN CENTRAL PACIFIC (Area 71) (Table 14)

The total catch from the area reached a record 7.0 million tons in 1987. The area comprises two different environmental regimes: the neritic zone with extensive continental shelves along the western Asian countries in the west, and the oceanic zone with very steep continental slopes and many reefs and atolls around the large number of island countries and along the eastern Asian countries, the northeastern parts of Australia and Papua New Guinea in the east. Most of the catch is taken along the continental shelves by the coastal countries of Indonesia, Malaysia, Philippines, Thailand and Viet Nam. The total catch of each of these countries has increased over the past decade with the exception of Malaysia. These fisheries are characterized by their strong dependence on demersal fish resources, primarily small-scale artisanal fisheries.

Countries from outside this region, including Japan, the Republic of Korea and the USA, have almost exclusively engaged in offshore fishing for skipjack and larger tunas although the USSR has engaged in some coastal fishing for both demersal and pelagic fish in the western part of the area.

The total demersal fish catch of the area has levelled off at between 700 000 and 800 000 tons from 1983 to 1987. Most stocks in nearshore waters have already been heavily exploited, with the possible exception of stocks in the northern Arafura Sea.

The worse situations occur in the inner part of the Gulf of Thailand, the Strait of Malacca, the shallow part of the Java Sea and the inner areas of the central Philippines. Increased landings are doubtful here until an adequate management scheme is employed, e.g., a combination of reduced fishing effort, size regulations and probably, the seasonal closure of spawning and nursery areas for the major stocks.

The demersal stocks in deeper, offshore waters may not be fully exploited in most areas with the exception of the Gulf of Thailand and the central to southern part of the Strait of Malacca. However, there is a need for controlled expansion of fishing effort to the offshore waters to prevent trawl overfishing there as well.

The landings of both the small coastal and large pelagic species have been increasing slowly over the past decade. The assessment of these stocks is hampered by inadequate statistics, incomplete knowledge of the geographic limits of a number of stocks in the area and, in some cases, uncertain identification of the several species involved. Several local stocks of small coastal pelagic fish have been fully or nearly fully exploited, e.g., mackerels and round scads in the Strait of Malacca and the inner part of the Gulf of Thailand, round scads in the Philippines and sardines in the Bali Strait. Larger coastal pelagic fish have probably been slightly to moderately exploited in recent years.

Most prawn/shrimp stocks in the Asian waters are heavily fished, with the possible exception of some stocks in the northern Arafura Sea. Catches in the area have levelled off during the past decade at 380 to 460 000 tons.

Coastal penaeid shrimp resources, especially tiger prawns, are being fully fished (or possibly overfished) in northern Australia; closure of nursery areas, gear restrictions and seasonal bans on daylight trawling have been implemented to ecourage recovery of the stocks.

Cephalopods are probably the only major resource in the region for which there is still ample room for increased fishing effort, with a potential annual catch of several hundred thousand tons. The annual catch has grown steadily in recent years to 196 000 tons in 1986 and 180 000 tons in 1987.

Squid are caught primarily as a by-catch of trawling but pelagic squids have scarcely been utilized. Dipnet fishing with lights, recently developed in Thailand, is a step in the right direction. The current catch of octopus remains at only several thousand tons, though the potential catch is believed to be substantial.

No multi or bilateral arrangements have been made to deal with resources management. The Indo-Pacific Fishery Commission (IPFC) of FAO and the IPFC Committee for the Development and Management of Fisheries in the South China Sea (CDMSCS) cover the geographic area, countries and subjects relevant to the development of fisheries in the area. However, neither the Commission nor the Committee has administrative powers, but only consultative responsibilities. The activities of the IPFC Standing Committee on Resources Research and Development (SCORRAD) are limited to consultation on resource research on rather a global and generalized basis.

EASTERN CENTRAL PACIFIC (Area 77) (Table 15)

This area was seriously affected by the 1982-83 "El Niño" phenomenon, which was one of the strongest anomalies of this kind in the century. It affected the overall distribution of fish as well as overall abundance of some stocks such as mackerels, pilchards, anchovies, shrimps, etc. Total catches dropped to 1.6 million tons in 1983, but then recovered to more than 2.6 million tons in 1985 and 1986 and 2.7 million tons in 1987. A much milder "El Niño" was present in the area in 1987.

The fisheries in the area is dominated mainly by pelagic fisheries in terms of volume and shrimp fisheries in terms of value.

Catches of mackerel (Scomber japonicus) have been highly variable. Most are taken off Ecuador and some smaller amounts off the USA. Catches were 131, 351, 161, 157 and 154 000 tons from 1983 to 1987, respectively. This stock seems to be moderately exploited.

Total catches of Californian pilchard (Sardinops caerulea) were 430, 380, 280, 370, 470 and 480 000 tons from 1982 to 1987. This stock is only being exploited by Mexico, although it is found off southern USA. Catches of North Pacific anchovy (Engraulis mordax) dropped from a maximum of 424 000 tons in 1981 to 102 000 tons in 1983, and since then, catches have been fluctuating between 120 000 and 170 000 tons per year. Most of these catches were made by Mexico since catches by the USA, the only other country exploiting this stock, decreased from 57 000 tons in 1981 to 4 000 tons in 1983. Annual catches by the USA have remained between 6 and 8 000 tons the last few years.

Catches of Central Pacific anchoveta (Cetengraulis mysticetus), taken mainly by Panama and Ecuador, continue to fluctuate from 207 000 tons in 1981 to 78 000 tons in 1982 and then between 110 and 245 000 tons in recent years. The total catch in 1987 was 110 000 tons. This stock seems to be moderately to fully exploited. Catches of unidentified fish also fluctuate considerably over the same time period. Most catches of unidentified species were reported by Mexico.

Catches of tuna recovered after dropping slightly in 1982 and 1983. Catches of skipjack tuna (Katsuwonus pelamis) were 81 and 90 000 tons in 1986 and 1987, after having been 147 000 tons in 1981. However, landings of other tuna increased. Catches of yellowfin tuna (Thunnus albacores) went from 113 000 tons in 1983 to 278 000 tons in 1986 and 294 000 tons in 1987.

Shrimp catches have increased to around 150 000 tons per year. Squat lobster catches have declined from 14 000 tons in 1981 to 7 000 tons in 1982 and 2 000 tons per year since 1984.

Part of this area was surveyed during 1987 by the R/V DR. FRIDTJOF NANSEN as part of a UNDP/NORAD/FAO project. They investigated the abundance, distribution, biology and other characteristics of the neritic fish resources in the Pacific from the southern part of Mexico to the southern part of Colombia. The data are still being analysed but the preliminary results indicate that there is a total biomass of more than 1 million tons of small pelagic stocks and 250 000 tons of demersal stocks in this zone. These surveys confirmed the high abundance of small pelagic stocks off Panama, and also indicated the presence of small concentrations of pelagic stocks off the other countries in the region. They also identified some concentrations of squid and an estimated biomass of over 200 000 tons of pelagic squat lobster (Pleuroncodes planiceps) in deeper waters, particularly off Nicaragua, El Salvador and Guatemala.

SOUTHWEST PACIFIC (Area 81) (Table 16)

This area includes New Zealand, a few island communities and a large area of deep open ocean. Most of the fishing is done in the vicinity of New Zealand by New Zealand boats and by vessels from Japan, the USSR and the Republic of Korea. Total catches for Area 81 have continued their upward trend from 385 000 tons in 1980 to 832 000 tons in 1987.

Catches of coastal demersal fishes round New Zealand have stabilized at around 200-300 000 tons from 1983 to 1987 in spite of increased fishing effort, indicating that the major demersal stocks are fully exploited; however, the statistics on catch and effort are considered inadequate to make satisfactory stock assessments.

Catches of small pelagic species have increased rapidly in the area and reached 124 000 tons in 1986 and 1987. The landings of grenadier also increased rapidly from 39 000 tons in 1985 to 105 000 tons in 1986, and 183 000 tons in 1987. The increased catches of small pelagic species and grenadier account for most of the recent increase in landings in this area.

The catch of orange roughy in New Zealand has declined over the past five years. The exact cause of the decline is unknown but the allowable catch has been lowered.

Rock lobster is the major inshore fishery in value in New Zealand. Concern has recently been expressed over the status of the resource. The fishery is not believed to be at its full potential and the resource is declining because of current high fishing effort. Biologists are predicting seriously diminishing catch unless there is some reduction in fishing effort.

The total landings of oysters have declined noticeably over the past few years.

Skipjack and albacore are lightly fished in the area and catches could be increased. The oceanic albacore fishery east of New Zealand continues to grow.

Landings of cephalopods have levelled off at present at 100-125 000 tons but they probably are one of the stocks capable of increased catches, particularly in oceanic waters.

The New Zealand Fishing Industry Board is responsible for the management of fisheries under New Zealand jurisdiction, and largely through a licensing policy has been able to stabilize a number of fisheries at good economic levels. The Board has also established a management policy for deep-water fisheries. Foreign vessels are licensed and given allocations of finfish and of squid that may be caught. This seems to be working satisfactorily.

SOUTHEAST PACIFIC (Area 87) (Table 17)

Catches in this area continued to be affected by the "El Niño" phenomenon. After the severe effects of the 1982-83 "El Niño", total catches recovered from 6.3 million tons in 1983 to 12 million tons in 1986. This is the highest catch recorded in this area since the anchoveta stock collapsed in 1972 and is similar to the catches of 13.8 million tons in 1970 and 12.1 million tons in 1971. Catches in the area dropped to 10.2 million tons in 1987 partially due to a mild "El Niño" phenomenon.

The sardine (Sardinops sagax) fishery continues to be the biggest in the area. After reaching a maximum catch of 5.8 million tons in 1985, catches dropped to 4.3 million tons in 1986 and 4.7 million tons in 1987. The stock seems to be fully exploited.

Jack mackerel is the second species of importance in terms of total weight with landings of 2.7 million tons in 1987. This stock is being exploited inshore by Chilean and Peruvian fleets, and offshore by the long-range fleet of the USSR together with some vessels from Cuba, Poland and Bulgaria. This stock seems to be moderately exploited.

The anchoveta stock showed some sign of recovery with high recruitment late in 1985 and 1986. Catches that had dropped to 894 000 tons in 1984, the lowest level ever recorded since the anchoveta fishery started more than 30 years ago, increased to almost 1 million tons in 1985 and to 4.9 million tons in 1986. Catches in 1987 were again affected by a mild "El Niño" phenomenon, and dropped to 2.1 million tons.

Catches of chub mackerel (Scomber japonicus) have been highly variable over the last few years; 175, 87, 34, 205, 87, 41 and 57 thousand tons from 1981 to 1987. The stock seems to be moderately exploited and fluctuations in catch seem to be mostly caused by natural changes in distribution and migration. This species is caught inshore by Peruvian and Chilean fleets and offshore by fleets of the USSR, and to a lesser extent by Cuba, Bulgaria and Poland.

The four pelagic species mentioned above make up more than 90% of the total catches in this area. The main demersal species being exploited is hake (Merluccius gayi) which has two stocks, one off central Chile and the other off northern Peru. The southern stock seems to be fully exploited and the northern stock seems to be recovering after experiencing a severe drop in landings. Total catch of both stocks was 64 000 tons in 1987.

Other demersal species of importance in the southern region are the Patagonian hake (Merluccius polylepis) with a catch of 57 000 tons in 1987, and the Patagonian grenadier (Macruronus magellanicus) with a catch of 132 000 tons, up sharply from 37 000 tons in 1986. Catches of cusk eel (Genypterus sp.) are stable at around 10 to 15 000 tons per year. Landings of South Pacific bream (Seriolella sp.) have increased from 8 000 tons in 1983 to 48 000 tons in 1987. Chilean herring (Strangomera bentincki) landings have been stable at around 31 to 38 000 tons since 1984.

Catches of squid increased to 19 000 tons in 1985, but dropped to 4.5 thousand tons in 1987. The potential yield of this resource is believed to be in the order of a few hundred thousand tons per year, although it is subject to a high variability. Saury also seems to be abundant in the region but attempts to exploit it have not been promising.

SOUTHERN OCEANS (Areas 48, 58 and 88) (Table 18)

The total catch in the Southern Oceans was 504 000 tons in 1986/87 and 458 000 tons in 1987/88, up from 264 000 tons in 1985/86 but down from the record catch of 649 000 tons in 1981/82. Most of the total catch is for krill, accounting for 85 percent of the total in 1986/87 and 71 percent in 1987/88. The bulk of both the finfish and krill catches taken in the Southern Oceans comes from the waters around the islands of South Georgia and South Orkney in the Atlantic Ocean (Area 48).

The Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR) is the scientific body for the area. It collects data on catch and effort, assesses the fish stocks and recommends management measures.

The major catch of finfish belongs to two endemic families: Nototheniidae (Antarctic cod) and Channichthyidae (icefish). Catches of other finfish are very low. A total of 430 000 tons of largely Antarctic cod was harvested from the accumulated virgin stocks at the start of the fishery in 1969/70. During the intervening 18 years the fishery has switched from one species to another and in the past seven years the Antarctic icefish (Champsopcephalus gunnari) has been the dominant species caught. The catch of this species declined steadily from 1982/83 to 1985/86 but in 1986/87 the catch increased five times that of the previous year. CCAMLR estimated that current fishing mortality on this species is very high with only one or two age-groups contributing to the fishery. The Commission's immediate objective for the Antarctic cod (N. rossii) is to rebuild the stocks as soon as possible. Preferably no catches should be taken at all, but this would not be possible if commercial fishing for other species continued.

The total krill catches have declined from 446 000 tons in 1985/86 to 359 000 tons in 1986/87. Most of the catch is taken by the USSR and Japan. The estimated

biomass and potential yield of the krill resources still remain unknown. No meaningful assessment can be made based on the data presently available.

The potential for the squid stocks is unknown and they have been relatively unexploited.

C. REGIONAL REVIEWS OF INLAND WATER RESOURCES

Clear estimates of the quantity of fish produced from inland waters and aquaculture are hard to obtain because of the different manner of reporting these items in various countries, the differing degrees of coverage and because of the importance of subsistence catch which is usually not covered at all. Estimates of aquaculture production often include fish from brackish and marine sources and may include all production from reservoirs, even where the only contribution from culture is stocking. Furthermore, yields from inland capture fisheries are not always separated in their entirety from reared fish. Thus, despite a trend to increasing catch from inland waters in all continents, it is not clear whether this is due to an expansion of aquaculture or to an improvement in the management of the fresh waters and their fisheries. Attempts are being made to clarify this problem by asking each country to separate out aquaculture production from their total fish catch.

The history of catches of fish from the inland waters of the various continents of the world is given in the table below, which shows that there has been an overall increase in production of approximately 75 percent since the early 1970's.

Production of fish by inland fisheries and aquaculture for the various continents (1970-87) based on nominal catch statistics

	Catch ('000 t)					
Continent	1970-74	1975-79	1980-84	1985	1986	1987
Africa	1271	1425	1450	1515	1646	1669
America, North	138	131	188	254	259	317
America, South	173	243	307	326	348	330
Asia	3815	4154	5434	7099	7691	7690
Europe	250	304	383	422	437	441
Oceania	1	2	9	10	11	7
USSR	858	830	838	906	927	988
TOTAL	6507	7089	8609	10532	11319	11442

AFRICA (Area 01)

Catches in Africa have been increasing slowly but steadily from 1.3 million tons in the early 1970's to an estimated 1.7 million tons in 1987. Theoretical calculations have estimated a potential fish yield of 3.4 to 3.9 million tons from the inland waters of the continent, however much of the unrealized potential is in waters which are relatively inaccessible and far from markets (Congo/Zaire, Okavango, etc.).

There has been a serious depletion of fish stocks in many parts of Africa due to change in the climate. This has been particularly marked in the Sahelian zone where Chad, Niger, Mali and Senegal have been the most affected with the virtual cessation of the floods of the Niger, Senegal, Logone and Chari Rivers and with the continued dessication of Lake Chad although better rainfall in 1985 and 1986 produced some recovery. Continued improved rains in the Nile drainage and the Sahel should benefit floodplain river resources and those of the Nile, Niger and Senegal reservoirs as well as other smaller fisheries.

The other significant changes in capture fisheries have resulted from some species transfers. The introduction of Nile perch (Lates niloticus) into Lake Kyoga in Uganda has resulted in the conversion of this previously highly productive multispecies fishery into one based upon three-species only with a resulting long-term drop in catch. The fisheries of Lake Victoria appear to be following a similar history, where the introduced predator is increasingly dominating the catch but is still increasing as part of the early phase of predatory expansion. The history of Lake Kivu following the transfer of Limnothrissa miodon from Lake Tanganyika has resulted in the creation of a new fishery of modest yield. Lake Kariba has had a successful fishery for this species for some time and a similar fishery could be developed downstream in Cobora Bassa Lake.

NORTH AMERICA (Area 02)

Catches have increased over the past few years due primarily to increased production from Mexico. In the USA and Canada emphasis on commercial catches is relatively low and the resources are utilized mainly for recreation. Recent attempts at improving the quality of the environment for fish, and particularly efforts to reconstruct the salmonid fauna of the Great Lakes should eventually raise the potential from these waters. Production from the inland waters of Mexico has increased considerably over the period under review. Much of this apparent increase may be the result of better statistics but there is no doubt that there has been increased attention to inland fisheries. Furthermore, there has been a considerable expansion in the aquaculture sector during the same period. More central American countries are taking a close look at aquaculture practices in the small and medium reservoirs throughout the region. Intensification of aquaculture and improvement in the management of small dams accounts for a large increase of inland fish production in Cuba.

SOUTH AMERICA (Area 03)

Catches of fish from the inland waters of South America continue to increase because of the rising emphasis on fish as a relatively cheap source of animal protein. There have been further expansions of the fisheries of the Amazon, Orinoco and Parana basins although some of the older fisheries such as those of the Magdalena River in Colombia have declined drastically due to pollution and other environmental pressures. The creation of many new dams and impoundments throughout the continent has also increased the potential for fish production.

Despite these recent increases in catch, the actual production from the continent remains very low when compared with the estimated potential of about 1.5 million tons from capture fisheries in lakes, rivers and coastal lagoons. Some of the shortfalls is probably due to poor recording of data, particularly on the subsistence and artisanal sectors of the fishery, although there is no doubt that local food preferences have resulted in the neglect of fisheries resources until recently.

ASIA AND THE PACIFIC (Areas 04 and 06)

Asia continues to produce the majority of fish of freshwater origin, about 67 percent of the world total. Total catch has doubled in this area since the early 1970's. This is mainly due to the widespread adoption of aquaculture. The resource base for capture fisheries has continued to enlarge through the creation of dams and reservoirs but some deterioration of the aquatic environment has been occurring through urbanization, industrialization and intensive farming. Capture fisheries, however, are insufficient to account for the increase in catch of 3.8 million tons recorded since the early 1970's. Intensification of rice production through double cropping and pesticide applications has for some time resulted in considerable losses of production for combined rice-fish capture and culture fisheries. More recently this policy is being reviewed in several areas and a return to systems permitting survival of fish should produce increased yields.

The catch in China presently accounts for about 45 percent of the total area catch. India, Indonesia and the Philippines have also continued growth of their inland fisheries throughout the period under review mainly through the expansion of aquaculture.

EUROPE AND USSR (Areas 05 and 07)

Production of fish from the inland waters of Europe and the USSR has risen by about 29 percent since the early 1970's. Western European fisheries have increased mainly because of a rapid increase in aquaculture in some countries. Increases in production have also been recorded from the countries of the Danube basin, where changes in the regime of the river, the creation of reservoirs and extensive aquaculture in the old floodplain water bodies all contribute to higher catches.

Table 1

Annual world landings of aquatic resources (million tons)
(excluding mammals and seaweeds)

	1948-52	1953-57	1958-62	1963-67	1968-72	1973-77	1978-82	1983	1984	1985	1986	1987
Total: All species	**21.9**	**29.0**	**39.8**	**53.9**	**67.1**	**66.2**	**73.0**	**77.4**	**83.6**	**85.9**	**92.2**	**92.7**
Inland waters	2.5	3.8	5.8	7.3	8.9	6.1	7.7	9.2	9.8	10.5	11.3	11.4
Anchoveta	0.0	0.1	3.7	9.0	10.0	2.8	1.4	0.1	0.1	1.0	4.9	2.1
Marine: less anchoveta	19.4	25.1	30.3	37.6	48.2	56.4	63.8	68.0	73.6	74.2	75.9	78.4

Source: 1948-86: Yearbooks of Fishery Statistics (Catches and landings) FAO, Rome.
1987: Provisional FISHDAB.

Table 2

Catches ('000 tons) by local and long-range fleets in selected regions in which fishing by countries outside the region is particularly important

Area	1970-74		1975-79		1980-84		1985		1986		1987	
	Local	Long Range	Local	Long Range	Local	Long Range	Local	Long Range	Local	Long Range	Local	Long Range
NW Atlantic	2014.8	2209.0	2125.7	1042.0	2496.5	298.9	2462.4	385.8	2416.0	484.4	2520.3	508.9
% of total area catch	47.7	52.3	67.1	32.9	89.3	10.7	86.5	13.5	83.3	16.7	83.2	16.8
EC Atlantic	1038.8	1962.5	1188.5	2119.1	1427.9	1756.1	1481.1	1379.1	1667.4	1376.7	1716.8	1637.7
% of total area catch	34.6	65.4	35.9	64.1	44.8	55.2	51.8	48.2	54.8	45.2	51.2	48.8
***SE Atlantic**	1707.4	1043.6	1216.8	1534.2	1147.1	1073.9	849.2	1271.9	877.1	1267.0	1486.7	1069.3
% of total area catch	62.1	37.9	44.2	55.8	51.6	48.4	40.0	60.0	40.9	59.1	58.2	41.8
NE Pacific	509.7	1882.3	652.2	1407.3	1087.7	1234.4	1826.9	1053.3	2257.5	949.8	2793.5	753.7
% of total area catch	21.3	78.7	31.7	68.3	46.8	53.2	63.4	36.6	70.4	29.6	78.8	21.2

Source: 1979-86: Yearbooks of Fishery Statistics (Catches and landings) FAO, Rome.
1987: Provisional FISHDAB.

* Source: ICSEAF Bulletins 1970 to 1987

Table 3

Northwest Atlantic (Area 21)

Stock	Main fishing countries (1987)	Catches ('000 t) 1970 -74	1975 -79	1980 - 84	1985	1986	1987	State of Exploitation
Atlantic cod	Canada, Spain, Portugal, France USA	972	538	654	635	635	633	Fully to overexploited
Red hake	USA, USSR	45	15	3	2	2	3	Fully exploited
Haddock	Canada,France,USA	35	42	67	50	55	53	Depleted
Saithe (=Pollock)	Canada, USA	34	43	54	66	77	72	Fully exploited
Silver hake	USSR, Cuba, USA	270	136	71	99	103	79	Under exploited
Roundnose grenadier	Germany DM RP, USSR	42	24	5	5	7	7	Moderately exploited
Atlantic redfishes	Canada, USSR	267	165	123	124	162	193	Fully to overexploited
Flatfishes	Canada, USA	284	238	212	202	213	209	Fully to overexploited
Other groundfish	USA,Canada,Spain	137	118	94	97	108	118	Recovering
Capelin	Canada, USSR	130	217	42	53	84	98	Recovering
Atlantic herring	Canada, USA	612	320	199	215	214	216	Depleted
Atlantic menhaden	USA	273	267	313	312	222	297	Fully exploited
Atlantic mackerel	Canada, Germany DM RP, USA	355	133	29	55	61	63	Underexploited
Other fish	USA,Canada,USSR	140	92	65	71	57	72	
Total fish		**3596**	**2348**	**1931**	**1986**	**2000**	**2113**	
Crabs	USA, Canada	46	50	95	99	94	95	Most stocks fully exploited
American lobster	USA, Canada	30	33	43	54	58	58	Overexploited
Northern prawn	Greenland	12	41	46	53	65	64	Fully exploited
Other shrimp	Canada	13	9	11	15	14	15	Fully exploited
Total crustaceans		**101**	**133**	**195**	**221**	**231**	**232**	
American cupped oyster	USA, Canada	173	146	118	52	70	58	Environmental impacts
Scallops	USA, Canada	73	182	152	108	130	173	Overexploited
Clams(softshell,quahogs)	USA, Canada	231	232	325	432	415	393	Fully exploited
Squids	Canada, Japan, Spain	45	117	58	23	23	26	Environmental fishery impacts
Other molluscs		5	9	16	26	31	32	
Total molluscs		**527**	**686**	**669**	**641**	**669**	**682**	
Others		0	0	0	1	1	1	
Total (all species)		**4224**	**3167**	**2795**	**2849**	**2901**	**3028**	

Source: Yearbooks of Fishery Statistics (Catches and landings) FAO, Rome.

* Part of stock occupies Western Central Atlantic (Area 31)

Management measures. All important stocks are covered by catch quotas divided among countries fishing in the region. These quotas are set by the coastal state (Canada, USA and the European Economic Community) for waters within 200 miles and by the North Atlantic Fisheries Organization (NAFO) for waters beyond national jurisdiction. In addition to quotas, there are controls on effort, gear, area and reason for various fisheries.

Note: The main fishing countries are listed in ranking order by catch size in this and the following tables.

Table 4

Northeast Atlantic (Area 27)

Stock	Main fishing countries (1987)	Estimated potential ('000 t)a/	Catches ('000 t) 1970 -74	1975 -79	1980 -84	1985	1986	1987	State of exploitation
Freshwater and diadromous	Norway,Finland,UK Scotland	Unknown	56	49	65	88	112	111	Unknown
Plaice	Netherlands,Denmark,UK	150	184	167	147	203	183	180	Fully/over exploited
Common sole	Netherlands, France	20-25	31	23	29	34	29	29	Fully/over exploited
Other flatfish	Iceland,Spain,France	150	159	127	147	143	146	161	Fully exploited
Tusk	Norway	Unknown	32	34	42	44	41	42	Unknown
Atlantic cod	Iceland, Norway, USSR, Denmark	1500-2000	1831	1714	1527	1313	1359	1436	Over exploited
Lings	France, Norway, Faeroe is.	Unknown	68	73	84	87	85	87	Unknown
Haddock	UK Scotland, USSR Norway, Iceland	400	601	385	312	327	363	344	Over exploited
Saithe (Pollock)	Norway,Iceland,France	700	646	537	439	439	374	382	Fully/over exploited
Polar cod	USSR	Unknown	193	18	29	11	1	0	Unknown
Norway pout	Denmark, Norway	Unknown	523	541	500	391	288	313	Unknown
Blue whiting (Poutassou)	Norway, USSR, Faeroe is. Denmark	Unknown	41	410	729	650	799	787	Fully exploited
Whiting	UK,Scotland,France Netherland	200-300	204	220	178	134	119	122	Fully/over exploited
European hake	Spain,France,Portugal	100-150	97	76	66	77	78	79	Fully exploited
Other gadoids	USSR,France,Spain	Unknown	42	52	53	45	66	55	Unknown
Sandeels	Denmark, Norway, UK Scotland	500	358	643	681	657	975	730	Fully exploited

Table 4 (continued)

Northeast Atlantic (Area 27)

Stock	Main fishing countries (1987)	Estimated potential ('000 t)a/	Catches ('000 t) 1970 -74	1975 -79	1980 -84	1985	1986	1987	State of exploitation
Atlantic redfishes	Iceland,USSR,Norway	250-500	155	312	292	276	260	232	Fully exploited
Monk (Angler fish)	France, Spain, UK Scotland	Unknown	35	37	53	60	57	60	Unknown
Other demersal fish	Denmark,Iceland,Norway, Faeroe is.	Unknown	145	155	117	110	135	187	Unknown
Capelin	Iceland,Norway,Faeroe is.	2000	1668	2921	2426	2188	1346	1201	Fully exploited. One stock depleted
Atlantic horse mackerel	Netherlands,Denmark, Spain	Unknown	279	234	169	202	225	227	Possibly fully exploited
Atlantic herring	Norway,Denmark,USSR Sweden,UK Scotland, Netherlands,Finland	2000-2500	1373	784	849	1305	1318	1321	Some stocks recovering others fully/over exploited
European sardine (pilchard)	Portugal, Spain	400	161	164	217	220	196	194	Moderately exploited
Sprat	Denmark,USSR	500-1000	402	748	426	214	204	242	Some fully/over exploited, others recovering
European anchovy	Spain	Unknown	35	47	17	13	12	12	exploited
Atlantic mackerel	UK Scotland,Norway Ireland,Netherlands	500	482	724	589	540	543	614	Over exploited
Tunas	Spain,Portugal	50	53	49	46	44	50	50	Fully exploited
Other pelagic fish	Portugal, Spain	Unknown	44	53	23	56	43	44	Unknown
Sharks	France,UK Scotland	Unknown	71	64	53	57	52	54	Unknown
Skates	France,UK Scotland	Unknown	31	27	31	34	35	37	Some species depleted
Other fishes	Denmark,France,USSR	Unknown	225	183	175	103	71	40	Unknown
Total fishes			**10226**	**11571**	**10511**	**10065**	**9565**	**9373**	

Table 4 (continued)

Stock	Main fishing countries (198)	Estimated potential ('000 t)a/	Catches ('000 t) 1970 -74	1975 -79	1980 -84	1985	1986	1987	State of exploitation
Crabs	France, UK England-Wales	Unknown	25	33	35	38	36	38	Unknown
Norway lobster	UK Scotland,France	50	36	39	46	55	53	53	Fully exploited
Northern prawn	Norway,Iceland	25-50	20	33	85	140	118	125	Fully/over exploited
Common shrimp + crangon	Germany FR, USSR	50	39	37	39	51	29	25	Fully exploited
Other crustaceans	Denmark, France	Unknown	18	10	13	13	6	8	Unknown
Total crustaceans			**138**	**152**	**218**	**297**	**242**	**249**	
Oysters	France	100 b/	70	99	102	139	137	137	Fully exploited
Blue mussel	Spain, Netherlands Denmark, France	Unknown b/	293	289	389	396	400	391	Moderately exploited
Scallops	Norway, Iceland, UK Scotland	50	41	44	49	50	61	61	Fully exploited
Common cockle	UK England Wales, Portugal	Unknown b/	30	26	17	10	23	23	Moderately exploited
Cephalopods	France, Portugal Spain	1000 b/	36	25	39	38	26	26	Vitually unexploited
Other molluscs	Portugal, France, UK England Wales	Unknown	40	31	28	19	25	27	Unknown
Total molluscs			**510**	**514**	**624**	**652**	**672**	**665**	
Total area c/			**10878**	**12239**	**11354**	**11015**	**10480**	**10288**	

Source: Yearbooks of Fishery Statistics (Catches and landings) FAO, Rome.

Note Management measures. The management regime of this region is in a period of transition, with the establishment of entailed jurisdiction by the coastal state, and the slow development of a common fishery policy by the EEC. A variety of measures, principally catch quotas, and controls on mesh sizes and sizes of fish have been set.

a/ Values are only indicative
b/ Aquaculture important
c/ Including grooved sea squirt, starfish and purple sea urchin

Table 5

Western Central Atlantic (Area 31)

Stock	Estimated potential ('000 t)	Main fishing countries (1987)	Catches ('000 t) 1970-74	1975-79	1980-84	1985	1986	1987	State of Exploitation
Freshwater and diadromous fishes	500	Venezuela	10	7	10	16	15	15	Fully exploited
Snappers	about 100	Mexico,Venezuela Cuba	21	19	22	24	25	26	Uneven, some stocks
Groupers		Mexico, USA,	24	21	26	23	22	24	Fully exploited
Grunts	a few 100	Venezuela,Cuba	29	24	8	9	9	9	(including shrimp by catch)
Sciaenids		Venezuela,USA	37	39	31	30	31	29	
Sharks and rays	50-100	Mexico, Venezuela	8	12	21	25	23	24	Moderately exploited
Other demersal fishes	unknown	Mexico, Venezuela USA	36	38	51	32	31	33	(including shrimp by catch)
Mullets	unknown	USA, Mexico	27	23	31	24	28	32	Uncertain b/
Atlantic menhaden	500	USA	51	80	83	47	34	26	Fully exploited
Gulf menhaden	500	USA	571	636	803	884	829	907	Fully exploited
Round Sardinella	some 100	Venezuela	44	40	50	59	55	55	Moderatley exploited
Other clupeoids	unknown	Venezuela,Cuba	20	15	11	10	8	8	Moderately exploited
King and Spanish mackerels	30-50	Mexico, USA,	21	22	23	19	20	21	Moderately to fully exploited
Other Tuna	a/	Venezuela	32	35	58	73	80	77	Larger species Moderately exploited
Other pelagic fish	200-400	Venezuela,Mexico	21	25	27	25	26	27	Moderately exploited
Unidentified fishes		Trinidad Tob, Turks, Caicos	129	157	245	274	277	266	
Total fish			**1081**	**1193**	**1500**	**1574**	**1513**	**1579**	
Crabs	50-150	USA, Mexico	35	40	49	51	49	56	Moderately exploited
Spiny lobsters	40	Cuba, Honduras	20	22	24	30	28	29	Most stocks fully
Shrimps	210	USA, Mexico	171	166	171	182	199	176	or over-exploited
Other crustaceans			1	1	0	0	0	2	
Total crustaceans			**227**	**229**	**244**	**263**	**276**	**263**	
Oysters	-	USA, Mexico	162	172	206	223	186	174	Large potential for culture
Cephalopods	100-1000	Mexico, Venezuela	5	7	10	10	13	12	Virtually unexploited
Calico scallop		USA	9	14	150	126	17	85	Moderately-fully exploited
Other molluscs		USA, Venezuela	17	33	38	54	43	43	
Total molluscs	**300-1200**		**193**	**226**	**404**	**413**	**259**	**314**	
Others			1	2	1	2	1	1	
Total area			**1502**	**1650**	**2149**	**2252**	**2049**	**2157**	

Source: Yearbooks of Fishery Statistics (Catches and landings) FAO, Rome.

a/ See Table 19
b/ Probably moderately to heavily fished if the discards by shrimp trawlers are taken into account

Table 6

Eastern Central Atlantic (CECAF - Area 34)

CECAF Sub-areas	Stock	Main fishing countries (1986)	Estimated potential ('000 t)	Catches ('000 t) a/ 1970 -74	1975 -79	1980 -84	1985	1986	1987 c/	State of exploitation
Total North				**2334**	**2207**	**1824**	**1051**	**1136**	...	
NORTH										
All sub-areas	Cephalopods			173	177	173	148	158	...	Overexploited
34.1.1, 34.1.3	Octopus	Morocco, Spain,	100-135	95	79	78	46	42	...	Grossly overexploited
34.1.3, 34.3.1	Cuttlefish	Spain, Senegal, Italy	30-40	31	25	24	14	10	...	Overexploited
34.1.1, 34.1.3	Squids	Italy, Spain	20-40	23	16	10	2	2	...	Overexploited
34.1.1, 34.1.3	European Pilchard	Morocco, Spain, Romania	1000 (variable)	392	630	484	299	320	...	Possibly fully exploited
34.1.3, 34.3.1	Sardinellas	Senegal, Guinea Romania	600 (variable)	169	173	155	144	153	...	Intensively exploited, locally overfished
34.3.1	Bonga	Senegal, Gambia	?	27	17	16	12	13	...	Unknown
34.1.3, 34.3.1	Horse mackerels	Romania, Germany DM RP, Senegal	400 (variable)	301	317	260	45	58	...	Possibly fully exploited and periodically overfished (decreasing recruitment)
34.1.3, 34.3.1	Mackerels	Romania, Senegal	100	87	82	83	6	12	...	Overexploited
34.1.1	Hakes	Morocco, Spain	6-12	10	20	6	7	6	...	Grossly overexploited
34.1.3, 34.3.1	Hakes	Spain	?	41	39	22	2	3	...	Assessments unreliable large variability
34.1.3, 34.3.1	Sea breams	Senegal, Italy Portugal	150(?)	91	53	32	22	23	...	Probably overexploited

Table 6 (continued)

CECAF Sub-areas	Stock	Main fishing countries (1986)	Estimated potential ('000 t)	Catches ('000 t) a/ 1970 -74	1975 -79	1980 -84	1985	1986	1987 c/	State of exploitation
Total South				**540**	**669**	**741**	**584**	**629**	...	
SOUTH										
34.3.3/34.3.4/ 34.3.5/34.3.6	All prawn and shrimp	Cameroon, Nigeria Gabon	15	4	11	19	18	18	...	Close to full exploitation
All sub-areas	Demersal		68-85	158	207	223	124	139	...	Fully exploited
34.3.4	Sardinellas (variable)	Ghana, Côte d'Ivoire	60	57	55	66	135	111	...	Round sardinella recovering; fully exploited (risk of periodical over-fishing)
34.3.6	Sardinellas	Congo, Zaire	Unknown	6	6	11	10	12	...	Probably moderately exploited
All sub-areas	Bonga	Nigeria, Sierra Leone, Cameroon, Côte d'Ivoire	Unknown	44	51	99	95	84	...	Intensively exploited; stock collapse in Ivory Coast
Total Oceanic				**56**	**62**	**120**	**14**	**13**	...	
OCEANIC 34.1.2/34.2.0/ 34.3.2/34.4.1/ 34.4.2										
TUNA 34.0 b/		Spain, Ghana France, Japan		200	258	309	274	239	...	Moderately to heavily exploited
UNKNOWN AREA 34.9.0					120	187	927	1019	...	
Total CECAF area a/					**3314**	**3181**	**2850**	**3036**	**3354**	

a/ Source: 1970-1986: CECAF Statistical Bulletins; Total area 1987: Provisional FISHDAB.
b/ Catches in all sub-areas; see also Table 19
c/ Data for 1987 not yet available.

Table 7

Mediterranean and Black Sea (Area 37)

Sector a/	Species Groups	Coastal countries	Estimated stocks	Catches ('000 t) b/ 1970	1975 -74	1980 -79	1981	1982	1983	1984	1985	d/
Balearic	Demersal	Algeria	Trawl only	32.4	37.0	46.7	38.2	46.8	44.2	41.9	44.2	
37.1.1	Coastal pel.	Morocco		93.2	132.4	133.6	152.7	157.3	161.8	165.8	146.1	
	Miscel.c/	Spain		10.3	22.7	23.9	38.6	30.3	26.7	25.5	22.7	
Gulf of Lions	Demersal		Finfish (shelf)	9.1	7.2	8.0	8.7	10.0	9.8	7.9	5.6	
37.1.2	Coastal pel.	France	Sardine	19.7	18.5	22.4	29.9	29.3	24.8	21.2	23.9	
	Miscel.c/			9.4	3.3	1.6	1.9	1.8	2.5	3.0	2.8	
Sardinia	Demersal	France	Trawl only	43.6	22.8	19.2	22.1	22.3	26.5	27.6	30.8	
37.1.3	Coastal pel.	Italy (W)		58.8	39.1	28.5	43.2	35.9	43.5	33.4	35.8	
	Miscel.c/	Tunisia (N)		15.1	12.4	12.5	11.9	11.7	14.2	15.3	16.3	
Adriatic	Demersal	Italy (E)	Trawl only	32.6	19.6	18.0	15.8	27.1	16.3	16.0	16.2	
37.2.1	Coastal pel.	Yugoslavia		80.2	91.7	121.6	138.6	124.5	121.4	105.7	119.8	
	Miscel.c/			30.6	37.2	27.3	29.5	20.8	41.0	49.1	23.6	
Ionian	Demersal	Albania,	Trawl only	37.8	42.2	38.4	39.8	34.3	54.7	77.9	86.4	
37.2.2	coastal pel.	Italy (S), Libya		32.2	43.8	50.0	46.0	56.4	46.5	53.2	56.1	
	Miscel.c/	Malta, Tunisia(E)		16.3	35.2	35.1	38.4	57.2	35.7	38.5	41.2	
Aegean	Demersal			17.5	22.2	26.2	25.1	28.3	29.4	25.5	33.4	
37.3.1	Coastal pel.	Greece (E)		23.2	35.8	46.1	43.3	46.4	45.2	47.4	67.8	
	Miscel.c/	Turkey (W)		7.5	10.2	12.9	12.3	6.5	6.9	7.6	7.7	
Levant	Demersal	Cyprus, Egypt	Finfish	10.0	12.0	13.1	15.3	12.0	13.3	11.9	14.6	
37.3.2	Coastal pel.	Israel, Lebanon		9.1	9.0	12.7	14.7	12.4	14.5	13.7	20.1	
	Miscel.c/	Syria, Turkey		4.1	3.1	4.2	5.2	2.8	4.1	3.6	3.7	
Whole	Demersal			183.0	163.0	169.6	165.0	180.8	194.2	208.7	231.2	
Mediter-	Coastal pel.			316.4	370.3	414.9	468.4	462.2	457.7	440.4	469.6	
ranean	Miscel.c/			93.3	124.0	117.5	137.8	131.1	131.1	142.6	118.0	
Total Mediterranean				**592.7**	**656.1**	**702.0**	**771.2**	**774.1**	**783.0**	**791.7**	**818.8**	
Black Sea	Demersal	Bulgaria, Romania		27.7	31.8	36.3	32.4	44.5	52.3	46.0	45.6	
37.4	Coastal pel.	Turkey		335.0	369.0	639.0	637.0	690.9	680.6	766.3	642.6	
	Miscel.c/	USSR		57.6	73.1	79.3	58.7	140.9	125.1	91.8	135.7	
Area 37.0	Tunas			22.9	26.4	36.4	46.9	56.6	59.4	42.9	50.5	
Total Area	Demersal			210.7	194.8	205.9	197.4	225.3	246.5	254.7	276.8	
b/	Coastal pel.			651.4	739.3	1053.9	1105.4	1153.1	1138.3	1206.7	1112.2	
	Miscel.			150.9	197.2	196.8	196.5	272.0	256.2	234.4	253.7	
	Tunas			22.9	26.4	36.4	46.9	56.6	59.4	42.9	50.5	
Total area b/				**1115.1**	**1293.9**	**1641.1**	**1699.3**	**1877.4**	**1888.2**	**1934.4**	**1885.6**	

a/ GFCM statistical divisions (boundaries given in GFCM Statistical Bulletins)
b/ Source for catch statistics by sectors: GFCM Statistical Bulletin.
c/ Miscellaneous: diadromous plus marine fisheries n.e.i.
d/ Total for 1986 = 1968.0 tons, for 1987 = 2000.3 tons. From Yearbook of FAO Fishery Statistics, subarea breakdown not available.

Table 8

Southwest Atlantic (Area 41)

Stock	Main fishing countries (1987)	Estimated potential ('000 t)	Catches ('000 t) 1970 -74	1975 -79	1980 -84	1985	1986	1987	State of exploitation
Argentine hake	Argentina, Uruguay, Brazil	400-600	144	318	329	372	377	381	Moderately to fully exploited
Southern blue whiting	Poland, USSR		0	11	131	95	104	132	Lightly to moderately exploited
Atlantic croaker	Brazil, Uruguay, Argentina	-	54	84	80	57	70	70	Moderately to fully exploited
Weakfishes	Brazil, Uruguay, Argentina	-	40	56	77	69	80	80	Moderately to fully exploited
Sardinella	Brazil	100-200	174	136	127	124	130	130	Moderately to fully exploited
Anchoita	Argentina,	1000	28	20	18	12	16	17	Virtually unexploited
Red shrimp	Argentina	not known (variable)	0	0	11	10	7	7	Fully to heavily exploited
Other prawns and shrimps	Brazil	60	48	54	52	69	70	70	Most stocks fully to heavily exploited
Squids and octopuses	Japan, Korea Rep., Spain, USSR, Poland	few 100s	4	44	150	270	307	610	Stocks fully exploited in the Patagonian shelf area, lightly exploited elsewhere.
Sprats	Argentina	few 100s	-	-	-	-	-	-	Unexploited
Other demersal Patagonian shelf stocks.	Poland, USSR, Argentina, Bulgaria	few 100s	2	11	24	44	74	93	Lightly or moderately exploited
Total			**815**	**1066**	**1359**	**1569**	**1714**	**2102**	

Source: 1970-1987: Yearbooks of Fishery Statistics (Catches and landings) FAO, Rome.

Table 9

Southeast Atlantic (Area 47)

Stocks		Main fishing countries (1987)	Estimated potential ('000 t)	Catches ('000 t) a/b/						State of exploitation
Species	ICSEAF divisions			1970 -74	1975 -79	1980 -84	1985	1986	1987 b/	
Hakes	1.1+1.2		10(?)	3	1	0	-	-	-	Probably moderate
	1.3+1.4	USSR, Spain	300	414	280	162	212	231	134	Recently overexploited
	1.5	Spain, Sth. Africa, USSR	140	231	162	116	201	150	136	Recently overexploited possibly some recovery
	1.6	Sth. Africa	160	164	106	89	72	109	96	Recently overexploited
	2.1+2.2	Sth. Africa	65	55	53	43	56	51	41	Biomass coming back to the level of maximum average yield
Kingklip	Mainly 1.4+1.5+1.6 +2.1+2.2	Sth. Africa, Spain	20(?)	12	10	8	14	15	12	Slightly overexploited
Large-eyed dentex	1.2+1.3+1.4	Cuba	Few 10s(?)	15	23	6	1	1	0	Fully exploited
Panga c/	2.1+2.2	Japan, Sth. Africa	8	8	6	2	2	2	2	Fully exploited
Sardinella c/	1.1+1.2+1.3	USSR	Few 100s(?)	92	125	205	211	165	100	Moderately exploited
Cunene	1.1+1.2	USSR		...	31	45	28	53	27	
Horse mackerel	1.3+1.4+1.5	USSR	500* or more with recent high recruitments	159	190	60	29	55	51	Intensively exploited
Cape horse mackerel c/	1.3+1.4+1.5	USSR, Romania, Bulgaria, Poland, Sth.Africa		161	386	283	428	448	517	
	1.6+2.1+2.2	Sth.Africa Japan	Varying, 100(?)	32	52	17	27	31	38	Moderately to highly exploited

Table 9 (continued)

Stocks Species	ICSEAF divisions	Main fishing countries (1987)	Estimated potential ('000 t)	Catches ('000 t) a/b/ 1970 -74	1975 -79	1980 -84	1985	1986	1987 b/	State of exploitation
Pilchard	1.3+1.4+1.5	Sth. Africa	About 600 before collapse, around 100s at present	462	279	47	57	53	67	Severely depleted Sharp decrease in biomass
	1.6	Sth. Africa	Varying* around 100	68	85	44	33	36	34	Depleted
Anchovy c/	1.3+1.4+1.5	Sth. Africa	at least 250	211	212	190	50	16	376	Fully exploited
	1.6	Sth. Africa	few 100s	233	244	315	273	300	596	Fully exploited
Chub mackerel	1.1+1.2+ 1.3+1.4	USSR Spain	Unknown	3	77	33	25	18	26	Probably intensively exploited
	1.6	Sth. Africa	Varying* around 50(?)	58	22	3	1	2	3	Fully exploited or depleted
Total area b/				**2751**	**2751**	**2221**	**2121**	**2144**	**2556**	

Source: 1970-74: information provided in FAO Fish. Circ. 710 updated on the basis of reports of December 1979 ICSEAF meeting

* Recruitment and consequently biomass and potential have considerably fluctuated since the outset of the fishery

a/ 1975-87 data: ICSEAF Bulletins
b/ Total production figures for the whole area: 1970-79 FAO Yearbook of Fishery Statistics Vol. 48;
1980-87 ICSEAF Bulletins
c/ Averages 1970-74; 1975-79; 1980-84, not revised.

Table 10

Western Indian Ocean (Area 51)

Stock	Main fishing countries (1987)	Catches ('000 t) 1970 -74	1975 -79	1980 -84	1985	1986	1987	State of exploitation
Shad (Hilsa)	India, Pakistan	11	9	4	2	2	2	
Giant sea perch	Pakistan	1	1	1	2	1	1	
Flat fishes	India	12	10	14	9	10	10	
Bombay duck	India	94	122	100	104	95	95	
Sea catfishes	India, Pakistan	60	58	52	33	45	45	
Lizard fishes	India, Egypt	2	8	9	6	7	7	
Pike congers	India, Pakistan	9	17	11	11	10	10	
Groupers	Saudi Arabia, UAE, Pakistan	4	4	12	17	18	18	Mostly moderately to fairly heavily exploited
False trevally	India	5	3	6	4	4	4	
Snappers	Pakistan, island states	4	5	7	8	9	10	
Ponyfishes	India	16	7	14	12	18	18	
Grunts	Pakistan	3	4	4	7	8	8	
Emperors (Lethrinids)	Tanzania, Saudi Arabia, UAE, Mauritius	6	12	18	27	34	35	
Croakers, drums	India, Pakistan	38	101	109	146	132	132	
Goatfishes	India	3	5	9	19	12	12	
Porgies, seabreams	Korea, USSR, Pakistan	8	10	13	15	17	22	
Threadfins	India, Pakistan	0	0	1	3	2	2	
Other identified demersal percomorphs	India, Tanzania	14	26	25	20	29	29	
Demersal Percomorphs n.e.i.	Yemen Dem.,Madagascar	32	44	77	82	89	70	
Black pomfret	Pakistan	4	5	3	4	4	4	
Butter fishes	India	23	28	36	28	23	24	
Carangids	Pakistan, Sri Lanka, India, UAE, USSR	28	53	60	69	69	76	
Sardinellas	India, Pakistan, UAE,	163	237	266	253	244	243	Stocks of small pelagic fish
Anchovies	India	31	40	53	48	40	40	Lightly to moderately exploited
Wolfherrings	India, Pakistan	7	11	16	19	12	12	
Mixed clupeoids	India, Sri Lanka, UAE	70	60	100	74	80	87	
Other identified pelagic percomorphs	Sri Lanka,India,Pakistan	22	29	42	42	42	46	
Pelagic percomorphs n.e.i.	Yemen Dem., Oman	188	145	115	86	79	67	

Table 10 (continued)

Stock	Main fishing countries (1987)	Catches ('000 t) 1970 -74	1975 -79	1980 -84	1985	1986	1987	State of exploitation
Kingfish or seerfish	Oman, India, Saudi Arabia	22	27	44	75	70	82	
Skipjack	France, Maldives, Spain, Sri Lanka	35	28	50	107	130	132	
Yellowfin	France, Spain, Korea Rep. Japan, Sri Lanka	25	28	43	81	89	92	
Longtail tuna	Iran, UAE	1	1	6	20	17	15	
Kawakawa	India, Pakistan	14	14	20	28	31	33	
Big-eye	Korea, Japan	12	22	25	31	28	31	
Albacore	Taiwan (P.China)	8	8	10	10	25	25	
Southern bluefin	Japan	5	3	5	3	2	2	
Billfishes	Korea, Japan	4	4	5	8	9	7	
Other tuna	Oman,Sri Lanka,India	24	26	25	34	36	55	
Hairtails	India, Pakistan	21	37	37	66	74	72	
Indian Mackerel (Rastrelliger)	India, USSR,	113	66	49	99	74	76	
Sharks, rays	India, Pakistan, Sri Lanka	101	107	97	84	85	84	
Other fish		250	343	346	528	563	565	
Total fish		**1493**	**1768**	**1939**	**2324**	**2368**	**2400**	
Crabs	Madagascar, S.Africa	0	1	1	2	2	2	
Lobsters	Oman,Yemen Dem.,Reunion	4	5	3	5	5	5	
Shrimps	India,Pakistan,Madagascar Mozambique,Saudi Arabia	200	225	220	258	239	240	Mostly fully exploited or overfished
Other crustaceans	Sri Lanka, India	8	15	21	11	10	10	
Total crustaceans		**212**	**246**	**245**	**276**	**256**	**257**	
Cuttle fish	YAR, Japan, USSR	10	17	7	8	8	5	
Other cephalopods and bivalves	India, Japan, Italy	4	9	13	21	19	19	
Total molluscs		**14**	**28**	**20**	**29**	**27**	**24**	
Total area		**1719**	**2042**	**2204**	**2629**	**2651**	**2681**	

Source: Yearbooks of Fishery Statistics (Catches and landings) FAO, Rome.

Table 11

Eastern Indian Ocean (Area 57)

Species group	Main fishing countries (1987)	Catches ('000 t) 1970-74	1975-79	1980-84	1985	1986	1987
Toli Shad	Bangladesh	0	0	11	72	84	104
Giant seaperch	Indonesia, Australia	1	1	2	3	3	3
Flatfishes	India	2	2	2	3	3	3
Sea catfishes	India	17	19	26	28	36	36
Lizard fish	India	2	5	4	4	5	5
False trevally	India	3	4	4	2	2	2
Sillago-whitings	Australia	2	2	2	3	3	3
Ruffs	Australia	5	4	4	6	6	6
Snappers	Indonesia	2	3	5	5	6	6
Threadfin breams	Thailand, Indonesia	1	3	4	3	5	5
Ponyfishes	India, Indonesia	28	33	39	32	29	29
Croakers	India, Thailand	21	27	31	32	38	37
Goatfishes	India	2	4	4	5	7	7
Halfbeaks and needlefish	India	1	9	8	10	11	11
Barracudas	India,Thailand,Indonesia	2	3	5	6	6	5
Threadfins	India	4	10	5	4	5	5
Carangids	India,Indonesia,Thailand	15	22	36	44	47	47
Butterfishes	India	6	8	14	11	15	15
Sardinella, sardines	India,Thailand,Indonesia	4	64	85	86	105	100
Anchovies	India	15	24	36	24	28	28
Wolfherrings	India	5	7	8	12	16	16
Other Clupeoids	India,Indonesia,Australia	57	23	29	31	30	30
Kingfish, seerfishes	India, Indonesia, Thailand	10	15	17	17	18	17
Skipjack	Indonesia	3	5	10	10	12	12
Yellowfin	Taiwan (P.China) Indonesia, Japan	5	10	10	6	13	13
Bigeye	Taiwan (P.China) Japan, Korea Rep.	4	13	13	12	13	14
Albacore	Taiwan (P.China), Japan	3	3	5	7	3	3
Southern bluefin	Australia, Japan	21	19	24	25	18	18
Marlins, billfishes swordfish	Taiwan (P. China) Japan	2	3	4	5	6	6
Other tuna	Indonesia,India,Thailand	8	15	30	27	29	28

Table 11 (continued)

Species group	Main fishing countries (1987)	Catches ('000 t) 1970-74	1975-79	1980-84	1985	1986	1987
Hairtails	India, Indonesia	23	30	32	39	36	35
Mackerels(Rastrelliger)	India,Indonesia,Thailand	15	28	40	46	53	50
Sharks and rays	India,Indonesia,Australia	31	37	45	41	42	42
Other, identified fish	Australia, Indonesia, Thailand, India	35	52	64	67	76	74
Marine fishes n.e.i.	Burma,Thailand, Bangladesh,India	457	654	782	828	869	832
Total fishes		**812**	**1161**	**1440**	**1557**	**1677**	**1647**
Sand and mud crabs	Thailand	0	14	6	6	9	8
Lobsters	Australia	12	14	16	17	16	16
Penaeid shrimps	India, Thailand	3	18	15	14	16	16
Sergestid shrimps	Australia, Indonesia	0	1	3	3	3	4
Other crustaceans	India, Bangladesh	29	42	59	73	88	96
Total crustaceans		**44**	**79**	**99**	**113**	**132**	**140**
Abalones	Australia	6	4	6	7	7	7
Oysters and mussels	Australia, Thailand	0	1	4	12	11	11
Scallops	Australia	4	4	18	15	14	14
Cockles and clams	Thailand	0	9	6	9	7	6
Cuttlefish and squids	Thailand	1	8	12	16	15	12
Other mulluscs	India, Thailand	0	2	4	5	11	11
Total molluscs		**11**	**28**	**50**	**64**	**65**	**61**
Jelly fishes	Thailand	0	2	27	25	61	50
Total area		**867**	**1270**	**1616**	**1759**	**1935**	**1898**

Source: Yearbooks of Fishery Statistics (Catches and landings) FAO, Rome.

Table 12

Northwest Pacific (Area 61)

Stock	Main fishing countries (1987)	Estimated potential a/ ('000 t)	Catches ('000 t) 1970 -74	1975 -79	1980 -84	1985	1986	1987	State of exploitation
Salmon	Japan, USSR	300-350	186	230	239	334	250	301	Somewhat depleted but recovering
Alaska pollack	USSR, Japan Poland, Korea Rep.	3000-5000	3014	3564	3618	4733	5154	4979	Fully exploited
Other demersal	Japan, China, USSR, Korea Rep.	2800-2900	1683	2068	1830	1999	2209	2025	Most stocks fully exploited or overfished
Pacific saury	Japan, USSR		283	334	235	274	251	247	
Japanese jack mackerel	Japan, Korea Rep.		192	116	108	174	122	129	
Pacific herring	USSR, Japan	5800-6500	465	248	145	203	249	303	Stocks fished close to maximum, taking into account fishing and natural fluctuations, by strong management measures
Japanese pillchard	Japan, USSR, Korea Rep.		157	1433	3959	4723	5191	5169	
Japanese anchovy	Japan, Korea Rep.		441	356	349	349	412	378	
Chub mackerel	Japan,USSR,China, Korea Rep.		1554	1808	1354	1217	1474	1341	
Largehead hairtail	China, Korea Rep.	650-700	673	571	669	636	561	567	Fully exploited
Tunas, billfishes b/	Japan, China Taiwan (P.China)	280-380	399	430	467	450	499	501	Most stocks fully exploited
Other small pelagic	Japan,Taiwan (P.China) Korea Rep.		387	490	532	578	615	588	
Marine fishes n.e.i.	China, Korea Dem. Japan, USSR	3800-3900 c/	2829	3502	3969	4304	4753	4701	
Japanese flying squid	Japan, Korea Rep.	300-400	425	285	267	192	128	151	Fully exploited
Total area		**19800-21600 d/**	**14570**	**17962**	**20742**	**23781**	**25840**	**25359**	**Nearly fully exploited**

Source: Yearbooks of Fishery Statistics (Catches and landings) FAO, Rome.

a/ Generally on a conservative basis
b/ Includes skipjack tuna, larger tunas, smaller tunas and billfishes
c/ Current level
d/ Includes, in addition to the above (1) other cephalopods (650-850); (2) prawn and shrimps (400-600), and (3) others (1750, current level)

Table 13

Northeast Pacific (Area 67)

Stock	Main fishing countries (1987)	Estimated potential ('000 t)	Catches ('000 t) 1970 -74	1975 -79	1980 -84	1985	1986	1987	State of exploitation
Salmons	U.S.A., Canada	250	197	219	354	435	399	355	Fully exploited
Pacific halibut	U.S.A., Canada	38	25	14	19	34	41	40	Depleted, recovering
Yellowfin sole	U.S.A., Japan	150-180	56	76	86	203	179	208	Moderately exploited
Other flatfishes	U.S.A., Japan, Korea Rep.	210-350	172	112	118	134	166	163	Moderately exploited
Pacific cod	U.S.A., Japan Canada, Korea Rep.	350-380	79	62	112	138	172	186	Moderately exploited
Alaska pollack	U.S.A., Korea Rep., Japan	1150-1600	1063	888	1086	1399	1605	1774	Fully exploited
North Pacific hake	U.S.A., Poland	210	169	163	95	99	186	326	Moderately exploited
Pacific ocean perch	Canada, U.S.A.	210	109	41	26	22	32	34	Depleted
Sable fish	U.S.A.	50-60	47	28	24	30	40	48	Moderately exploited
Pacific herring	U.S.A., Canada	several 100s	114	101	78	82	68	64	Local stocks in different states
King crabs	U.S.A.	30-50	40	53	32	7	12	13	Depleted
Pacific snow crabs	U.S.A., Japan	50-80	31	52	39	39	50	52	Fully to heavily exploited
Pacific ocean shrimps	U.S.A.	Unknown	54	67	22	14	28	32	Fully to heavily exploited
Total area			**2392**	**2059**	**2322**	**2880**	**3207**	**3547**	

Source: Yearbooks of Fishery Statistics (Catches and landings) FAO, Rome.

Table 14

Western Central Pacific (Area 71)

Stock	Main fishing countries (1987)	Catches ('000 t) 1970 -74	1975 -79	1980 -84	1985	1986	1987	State of exploitation
Demersal fish	Philippines, Indonesia Malaysia, Thailand	491	622	654	727	785	790	Inshore stocks heavily exploited
Coastal small pelagic fish								
Mackerels(Rastrelliger)	Thailand,Indonesia, Malaysia,Philippines	222	237	323	403	365	371	Scads and mackerels
Round scads	Philippines,Indonesia Malaysia	264	345	291	347	402	443	
Sardinellas	Indonesia,Philippines, Thailand	175	343	395	308	344	354	
Anchovies	Philippines,Indonesia Thailand	148	174	244	327	279	289	moderately exploited
Total		**809**	**1099**	**1253**	**1385**	**1390**	**1457**	
Coastal larger pelagic fish								
King/Spanish mackerels	Indonesia,Philippines Malaysia	55	62	84	78	90	89	
Smaller tunas a/	Philippines, Thailand Malaysia	62	95	163	206	197	214	Moderately exploited
Total		**117**	**154**	**247**	**284**	**287**	**303**	
Skipjack tuna	Indonesia and Philippines	42	70	100	139	165	161	Approaching maximum level
	Major Oceanic countries c/	30	48	45	36	45	51	
	Non-coastal countries d/	103	156	227	192	346	353	
Total		**175**	**274**	**372**	**367**	**556**	**565**	
Yellowfin tuna	Indonesia and Philippines	48	62	66	95	94	86	
	Major Oceanic countries c/	4	8	6	10	5	9	(see tuna review)
	Non-coastal countries e/	27	56	86	71	114	162	
Total		**79**	**126**	**184**	**176**	**213**	**257**	
Penaeid shrimps	Thailand,Malaysia, Indonesia,Philippines	195	228	260	220	247	261	Most stocks fully or heavily exploited
other shrimps and prawns	Vietnam,Indonesia Malaysia,Thailand	83	137	155	167	171	179	
Total		**278**	**365**	**415**	**387**	**418**	**440**	
Cephalopods b/	Thailand,Philippines Malaysia,Vietnam	95	136	161	168	196	180	Only slightly to moderately exploited
Total area		**4468**	**5217**	**5991**	**6374**	**6962**	**7091**	

Source: Yearbooks of Fishery Statistics (Catches and landings) FAO, Rome.

a/ Bullet and frigate tunas, kawakawa and longtail tuna. Nominal statistics are incomplete, only a few countries separated these species
b/ Squids, cuttlefish and octopuses
c/ Fiji, Kiribati and Solomon Islands
d/ Japan, Korea Rep. and U.S.A.
d/ Japan, Korea Rep., U.S.A. and Tawain, Province of China

Table 15

Eastern Central Pacific (Area 77)

Stock	Main fishing countries (1987)	Estimated potential ('000 t)	Catches ('000 t) 1970 -74	1975 -79	1980 -84	1985	1986	1987	State of exploitation
Freshwater and diadromous fishes	USA, Mexico		2	2	1	3	4	4	
Demersal fishes	Mexico, USA	1000-2000	81	70	94	74	65	67	Lightly exploited
Chub mackerel	Ecuador, Mexico, USA	few 100s	68	378	308	161	157	154	Moderately exploited
Pacific jack mackerel	USA	100-500	19	27	18	10	11	12	Lightly exploited
Californian pilchard (=sardine)	Mexico	a/	58	143	353	372	471	477	a/
North Pacific anchovy	Mexico	500-1000	92	238	280	154	123	167	Lightly exploited
Central Pacific anchoveta	Panama, Ecuador	few 100s	38	107	147	245	110	110	Moderately to fully exploited
Pacific thread herring	Ecuador, Panama	few 100s	17	19	50	38	40	40	Moderately to fully exploited
Other coastal pelagic fishes	Ecuador, Mexico, USA	500?	8	14	185	708	640	647	Lightly exploited
Skipjack tuna	Ecuador,Japan,USA	250	62	121	114	163	81	90	Moderately exploited
Northern bluefin tuna	USA, Mexico		9	8	2	4	5	1	Moderately exploited
Albacore	Korea Rep.,Taiwan (P.China)Japan	100-200	15	20	24	33	32	22	Moderately exploited
Bigeye tuna	Japan, Korea Rep.	b/	42	69	63	81	98	101	Moderately exploited
Yellowfin tuna	Mexico, USA	200-250	167	200	153	228	278	294	Fully exploited
Other oceanic fish	Japan, Korea Rep., Mexico, USA	100-500?	38	37	35	32	36	39	Lightly exploited
Unident. fishes	Ecuador, Mexico		153	125	168	154	259	234	
Total fishes c/			**869**	**1578**	**1995**	**2460**	**2410**	**2459**	
Dungeness and Pacific rock crabs	USA	500?	2	1	0	1	1	1	Unexploited
Shrimps	Mexico,Ecuador,Panama	80	80	73	110	120	135	147	Fully exploited
Other crustaceans	El Salvador,Mexico, Ecuador		4	12	13	12	16	17	
Total crustaceans		**600**	**86**	**86**	**123**	**133**	**152**	**165**	
Squids	USA,Japan,Korea Rep.	500-100?	11	14	23	25	36	41	Lightly exploited
Other molluscs	Mexico, Ecuador		20	19	29	26	32	31	
Total molluscs			**31**	**33**	**52**	**51**	**68**	**72**	
Others			3	3	8	10	14	21	
Total area			**987**	**1700**	**2178**	**2654**	**2644**	**2717**	

Source: Yearbooks of Fishery Statistics (Catches and landings) FAO, Rome.

a/ Potential varies - USA fishery collapsed in the 1950s
b/ See also Table 19
c/ Includes freshwater fishes

Table 16

Southwest Pacific (Area 81)

Stock	Main fishing countries (1987)	Estimated potential ('000 t)	Catches ('000 t) a/ 1970 -74	1975 -79	1980 -84	1985	1986	1987	State of exploitation
Demersal	New Zealand, Japan Australia	appr. 500	60	90	197	200	256	244	Moderately to heavily exploited in some areas
Poutassou	New Zealand	Not available	23	19	16	7	15	16	Unknown
Grenadier	New Zealand, USSR		7	49	38	39	105	183	
Small pelagic	USSR, Japan,	appr. 1000	12	25	21	40	124	124	Probably mostly exploited
Jack mackerels	New Zealand, Japan	Not available	14	13	17	22	28	34	Unknown
Rock lobsters	New Zealand	6	5	4	5	6	5	5	Fully exploited
Oysters	New Zealand	b/	19	20	18	11	8	7	Probably fully exploited
Cephalopods	Japan, New Zealand	Not available	8	37	99	123	101	112	Lightly exploited
Total area			**247**	**373**	**531**	**571**	**739**	**832**	

Source: Yearbooks of Fishery Statistics (Catches and landings) FAO, Rome.

a/ Main Australian fishery in Tasmania/South Australia now considered under Indian Ocean
b/ Potential harvest dependent on intensity of aquaculture

Table 17

Southeast Pacific (Area 87)

Stock	Main fishing countries (1987)	Estimated potential ('000 t)	Catches ('000 t) 1970 -74	1975 -79	1980 -84	1985	1986	1987	State of exploitation
Chilean hake	Peru, Chile	100-200	139	194	85	47	74	64	Fully exploited
Chilean jack mackerel	Chile, USSR Peru	over 2000(?)	173	776	1838	2148	1961	2680	Moderately exploited
Patagonian hake	Chile		0	9	37	32	39	57	
Patagonian grenadier	Chile		0	3	22	19	37	132	
South Pacific breams	Peru, Chile		16	18	20	20	41	48	
South American pilchard (=sardine)	Peru, Chile	3000(?)	103	1512	3743	5814	4333	4686	Fully exploited
Chilean herring	Chile		131	31	35	38	38	32	
Anchoveta (=Peruvian anchovy)	Peru, Chile	Unknown[a/]	6959	2251	884	987	4945	2101	Depleted
Eastern Pacific Bonito	Peru		51	7	18	10	5	19	
Chub mackerel	Chile, Peru		35	163	142	87	41	57	
Squids	Chile, Peru	Some 100s	0.6	0.6	1.9	19.1	5.6	4.5	Virtually unexploited
Sauries	Chile, Peru	Some 100s	-	-	-	-	-	-	Unexploited
Total area			**7894**	**5275**	**7132**	**9593**	**11948**	**10242**	

Source: Yearbooks of Fishery Statistics (Catches and landings) FAO, Rome.

a/ Potential used to be 9 000-11 000 tons under conditions occurring in the 1960s

Table 18

Southern Oceans (Areas 48, 58 and 88)

Stock	Main fishing countries (1987)	Catches ('000 t) 1970 -74	1975 -79	1980 -84	1985	1986	1987	State of exploitation
N. Rossii								
Area 48 a)	Poland, USSR	83	7	11	2	0	0	Over-exploited
Area 58 b)	USSR	47	13	5	2	1	0	Over-exploited
N. squamifrons								
Area 48 a)	USSR	0	2	0	1	0	0	Unknown
Area 58 b)	USSR	22	11	7	7	3	3	Heavily exploited
Patagonothen brevicauda								
Area 48 a)	USSR	0	3	18	12	16	9	Unknown
N. gibberifrons								
Area 48 a)	Poland, USSR	0	8	7	8	2	3	Heavily exploited
C. gunnari								
Area 48 a)	USSR, Poland	3	62	63	16	14	72	Heavily exploited
Area 58 b)	USSR, France	24	28	10	8	17	4	Heavily exploited
Other fishes								
Area 48 a)	Germany DM RP, Poland, USSR	1	16	17	8	4	5	
Area 58 b)	USSR	3	1	1	8	1	3	
Area 88		0	0	0	0	0	0	
Total fishes								
Area 48		**87**	**98**	**116**	**47**	**36**	**89**	
Area 58		**96**	**53**	**23**	**25**	**22**	**10**	
Area 88		**0**	**0**	**0**	**0**	**0**	**0**	
Krill								
Area 48	USSR, Japan, Chile,	5	92	253	181	426	326	Probably
Area 58	USSR, Japan	0	27	104	6	16	31	under-exploited
Area 88	Japan	0	1	5	5	4	2	
Total area								
Area 48		**92**	**190**	**369**	**228**	**462**	**415**	
Area 58		**96**	**80**	**127**	**31**	**38**	**41**	
Area 88		**0**	**1**	**5**	**5**	**4**	**2**	
Total Southern Oceans		**188**	**271**	**501**	**264**	**504**	**458**	

Source: Yearbooks of Fishery Statistics (Catches and landings) FAO, Rome.

a/ Principally around South Georgia.
b/ Principally around Kerguelen.
c/ Split year fishing season: July 1 to June 30; split-year data shown under the calender year in which the split-year ends.

Table 19

Oceanic tunas and billfishes

Ocean	Species	Main fishing countries (1987)	Estimated potential ('000 t)	Catches ('000 t) a/ 1970-74	1975-79	1980-84	1985	1986	1987	State of exploitation
Atlantic	N. Bluefin	Italy, France, Spain, Japan, Turkey	20-30 b/	16	23	22	25	23	23	Heavy
	Albacore	Taiwan (P.China), Spain	70-90	78	72	64	74	67	67	Heavy
	Yellowfin	Spain, Venezuela, France, Japan	120-160	86	124	147	158	141	135	Heavy
	Bigeye	Japan, Spain, Portugal, France	50-100?	51	53	66	77	60	59	Moderate
	Skipjack	Spain, Ghana, Brasil Venezuela	200-300?	75	87	134	118	124	121	Moderate
	Billfishes including Swordfishes	Spain, USA, Japan, Cuba, etc.	20-50?	21	21	29	44	31	31	Probably heavy (i.e., blue and striped marlin)
Total oceanic tunas & billfishes		Atlantic Ocean		327	380	462	496	446	436	
Small tunas & seerfishes		Turkey, Mexico, Ghana Senegal, other		89	85	121	93	88	100	
	Total Atlantic Tuna			**416**	**465**	**583**	**589**	**534**	**536**	
Indian	S. Bluefin e/	Australia, Japan	35-40	50	38	43	35	25	25	Heavy
	Albacore	Taiwan (P.China), Japan, Korea Rep.	15-20 c/d/	11	11	16	16	28	28	c/
	Yellowfin	France, Spain Korea Rep.	100-150	30	38	53	88	102	105	Moderate
	Bigeye	Japan, Korea Rep. Taiwan (P.China)	30-60?	17	35	38	43	41	44	Moderate
	Skipjack	France, Maldives, Spain, Sri Lanka	200-400	38	34	60	117	141	144	Ligthly
	Billfishes	Korea Rep., Japan, Taiwan (P.China)	10?	6	7	10	15	16	13	Moderate
Total oceanic tunas & billfishes		Indian Ocean		152	163	220	314	353	359	
Small tunas and seerfishes		India, Sri Lanka Pakistan, UAE, Yemen Dem., Iran	200-300?	55	81	126	192	195	225	
	Total Indian Ocean Tuna			**207**	**244**	**346**	**506**	**548**	**584**	
Pacific	N. Bluefin	Japan, USA	d/	20	19	19	11	14	10	Fully
	Albacore	Japan, Taiwan (P.China) Korea Rep.	d/	121	118	104	92	85	76	Probably near fully
	Yellowfin	USA, Japan, Mexico Philippines, Indonesia	d/	291	378	389	460	529	587	Fully in East
	Bigeye	Japan, Korea Rep., Taiwan (P.China)	120-130	83	123	110	124	147	151	Probably near fully
	Skipjack	Japan, USA, Indonesia Philippines, Korea Rep.	1500?	390	554	657	650	812	831	Moderate
	Billfishes	Japan, other	60?	59	62	62	57	66	70	Possibly heavy (i.e., blue marlin)
Total oceanic tunas and billfishes		Pacific Ocean		964	1254	1341	1394	1653	1725	
Small tunas and seerfishes		Indonesia, Philippines, Japan, Thailand, Korea Rep.		356	383	562	676	689	723	
	Total Pacific Ocean			**1320**	**1637**	**1903**	**2070**	**2342**	**2448**	
Total all oceans oceanic tunas and billfishes				1443	1797	2023	2204	2452	2520	
Total all oceans small tunas and seerfishes				500	549	809	961	972	1048	
Total all tunas and tuna-like fishes				1943	2346	2832	3165	3424	3568	

a/ Source: 1970-86: Yearbooks of Fishery Statistics (Catches & landing) FAO, Rome. 1987: Provisional FISHDAB.
b/ Depends on strength of recruitment, which appears highly variable
c/ Longline stocks are heavily exploited. Figures of potential are for this fishery only
d/ No ocean-wide estimate of potential covering all sizes and methods of capture available
e/ Includes S. Bluefin caught in the Pacific and Atlantic